THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

Vol. 10, No. 6 November-December, 1960

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THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

CALENDAR

December 8, 1960. Annual Holiday House Tour sponsored by the Volunteer Associates of The New York Botanical Garden.

December 16, 1960. Christmas Show opens in The Conservatory of The New York Botanical Garden.

December 27, 1960. Special symposium sponsored by The Torrey Botanical Club, Hotel Biltmore, New York City. See page 242 this issue.

January 5, 12, 19, 26, 1961, 11 a.m. Downtown Lecture Series sponsored by the Volunteer Associates of The New York Botanical Garden. Mrs. John Fiske and Mrs. Marcus Fair, Co-Chairmen of the Committee on Arrangements.

January 9, 1961. Theater Benefit sponsored by the Volunteer Associates of The New York Botanical Garden; "Critic's Choice" with Henry Fonda at the Barrymore Theatre. Mrs. Marshall F. Dancy and Mrs. Oliver A. Vietor, Co-Chairmen of the Committee on Arrangements.

February 28, 1961. Reserve this date for Members' Evening of The New York Botanical Garden. Program will be announced later.

April 18-28, 1961. Third International Rock Garden Conference arranged jointly by Alpine Garden Society in London, with cooperation of the Royal Horticultural Society, and Scottish Rock Garden Club in Edinburgh, with cooperation of Regius Keeper, Royal Botanic Garden, Edinburgh.

April 22-29, 1961. Twenty-eighth annual Historic Garden Week in Virginia. Proceeds to be used towards completion of the gardens on the East Lawn of the University of Virginia.

May 4, 1961. Spring Garden Tour to Bucks County, Pennsylvania, sponsored by The Volunteer Associates of The New York Botanical Garden.

May 12-14, 1961. International Rhododendron Conference in Portland, Oregon, under the auspices of the American Rhododendron Society.

April 27-May 7, 1962. Floralies, International Horticultural Exposition, under auspices of Société d' Horticulture and Jardin Populaires de France, in Valenciennes, France.

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CREDIT FOR ILLUSTRATIONS

We are indebted to the Display Committee, Mrs. Charles Burlingham, Mrs. Richard S. Meredith, and Mrs. Donald B. Straus, for the selection of the front cover illustration—one of the tropical houses of the Conservatory of The New York Botanical Garden, photo by E. N. Mitchell; p. 206, The New York Botanical Garden; p. 210, E. N. Mitchell; p. 212, David J. Rogers; p. 213, Lincoln Adderley; p. 214, Howard W. Swift; pp. 215, 216, U. S. National Arboretum, pp. 218-220, T. H. Everett; pp. 221, 222, Joseph C. McDaniel; pp. 224-227, Brownell's Holly Farms; p. 228, **Gesneriad** Journal; p. 229, Figs. 3 and 5, Paul Arnold, Fig. 4, Peggie Schulz; p. 232, Gottscho-Schleisner; pp. 239-242, E. N. Mitchell. Poinsettia, p. 207; pine, p. 208; American holly and mistletoe, p. 209, cardinal flower, p. 234, Charles C. Clare, Jr.

The Garden Journal is published bimonthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. at 400 Watchung Ave., Plainfield, N. J. Second Class Postage paid at Plainfield, N. J. Annual subscription, $3.00. Single copies $.55. Foreign countries and anywhere outside the continental United States, $.50 a year extra.

Dr. Bernard Ogilvie Dodge passed away in St. Luke's Hospital, New York, in the evening of August 9, 1960. He was born in Mauston, Wisconsin, on April 18, 1872.

Dr. Dodge was Plant Pathologist at The New York Botanical Garden from 1928 to his retirement with the title of Emeritus in 1947. His outsanding researches in plant pathology, in mycology, and in genetics are well known.

Besides being an eminent scientist, Dr. Dodge enjoyed the warm affection of all who knew him; his colleagues at the Garden and elsewhere have suffered a personal loss.

"HOW COME"

Excerpts from Autobiographical Notes by the late Dr. B. P. Dodge.

"ONLY IN ONE of the many years of my father's long and active life did he keep a diary. That was the year of my birth, 1872. Back in colonial days it was a custom to record births, marriages, and deaths in family bibles, in church baptismal records, in the offices of county clerks or registrars of deeds. In some places such records are still preserved. However, when inhabitants of New England moved into the Middle West and farther, the settlers often neglected to preserve the records. My father's diary proved a valuable asset, since there are neither family nor county records of my birth and citizenship to be had, and anyone without such records applying for a passport or Social Security benefits in recent decades finds himself in an embarrassing position. The diary was accepted at the U. S. Passport Office in 1930 for a passport to travel in various countries in Europe. The Office of Social Security later accepted the diary and passport as proof of my birth and citizenship.

"The entry for Thursday, April 18, 1872, was brief: 'Son born . . . about 1 p.m.' When I asked my father if he would make me a present of the little book, he complied. He seemed to realize that the entry was not very informative, as he wrote just below: 'Apr. 22, 1900. The son referred to is yourself, Bernard Ogilvie Dodge. Your father, E. G. Dodge.'

"In order to understand how I came to make botany my life work, it should be recalled that in high school at Mauston, Wisconsin, the botany teacher, Mrs. Goetting (also English teacher, history teacher, and so forth), knew little about plants. Since it was only a three months' course—this was nearly seventy years ago—botany consisted mostly of learning how to analyze plants and give them specific names. We had very little knowledge about the lower forms of plant life, such as fungi, algae, or bacteria. Mrs. Goetting had each student collect in the wild at least seventy-five species of plants and identify them, following Gray's School and Field Botany Keys. We learned, along with other characteristics, about the arrangement of leaves but nothing about the spiral arrangement as related to the Fibonacci series of fractions, and this with logarithmic spirals and the Golden mean! These collections were presumed to be dried and pressed botanical specimens. For each twenty-five species more than the minimum seventy-five, we were given a higher grade. I ended up with a standing of 125!

"My interest in plants did not end on graduation day, June 10, 1892; but it was several years before I became interested in plants in general, especially the lower forms. One of my courses as an adult special student at the University of Wisconsin, in 1896, was with Prof. Charles R. Barnes who later went to the University of Chicago as professor of plant physiology. He had originally specialized in mosses, liverworts, and other lower forms of plant life.

"As teacher of botany at the Algoma High School, I became interested in types of plants that grow in swamps and woods. The liverworts were especially interesting, particularly after we had purchased a good microscope—one for the whole class of twenty or more students. They were fascinated to examine under the microscope such algae as *Spirogyra, Hydrodictyon,* and diatoms. The boys would come to the school-house in the evening, if they saw a light in the laboratory. They never knew what kind of show I was putting on! At first we had only a kerosene lamp to light the microscope—one of the stage footlights loaned by the Perry Opera Hall. I discovered on one of those evenings something I had never seen before and have never seen since; that was the process by which an antherozoid of a little leafy liverwort migrated down the neck of the archigonium and finally appeared to fuse with the egg.

"Some years later at Columbia University, I studied *Marsilia* to show the class in botany stages in fertilization. The antherozoids would swim into the jelly-like mass, but I could never find that they seemed to fuse with the egg in the archigonium. Later I learned that the species was said to be apogamous!

"While Principal of the Algoma High School, I taught botany and physics regularly and sometimes geometry. One afternoon I went into a swamp to collect *Spirogyra* and *Hydrodictyon* for classes the next day . . . Walking back home along a narrow dark road, I met an old Bohemian tailer . . . who had several curious things in his basket. I asked him what he had. He said, 'Pilze'. 'What are you going to do with them?' 'Gut für essen,' he replied.

"Here I was teaching botany, and I did not know what a common mushroom looked like. I found out later that he had specimens of a species often erroneously reported to be poisonous and not an edible mushroom at all—probably *Boletus luridus* or *B. satanus.* I never heard of any one in that region being poisoned by eating those *Boletus* 'toadstools.' The secret of this is probably that they knew from experience a few species that were safe, and avoided the ones they did not know 'for sure'.

"We had no books on mushrooms in the high school library, so I sent specimens to the Department of Botany at

the University of Wisconsin. Their reply was to the effect that a mushroom that turned blue when broken open was poisonous and so was a 'toadstool' . . . When I would give friends a basket of mushrooms from the wild, they would not touch them until they had been shown to Mr. Danek, Mr. Thiard, or Mr. Pauly, or some authority better than Dodge.

"Finally I was able to buy a book on mushrooms by Prof. George Atkinson of Cornell. Then Mrs. Dodge made me a Christmas present of MacIlvaines' *One Thousand American Fungi.* With these two books, I was able to identify a number of fleshy fungi. Some of the species had been dried and were later brought to Columbia University . . . where I registered in 1910 for graduate work on the fungi.

"Leaving Algoma in 1908 to attend the University of Wisconsin for one year in order to finish my studies for the Ph.D. degree, I prepared for my thesis a report on most of the species I had collected in Wisconsin mostly from Kewaunee County. This thesis was revised, added to later, and published in 1914. In all, over six hundred were listed with many comments.

"My contacts with such authorities as Heinrich Rehm of Munich, Bresadola of Austria, and Charles Peck, the famous New York State botanist, were factors leading to [my] future interest in the morphology, taxonomy, pathology, and genetics of the fungi.

"Some years ago I . . . [gave] the first annual address of the Mycological Society of America . . . on September 12, 1950. The title of the address was 'The Fungi Come Into Their Own.' The final sentence of the address was: So I shall wait around until this is done [until biochemists report on virus diseases of the fungi]; then I can say the old red bread mold has at last come into its own. No doubt bakers would have said: At last that pest has got what was coming to it. On the plus side of this account, it should be noted that a Nobel Prize was awarded in recent years jointly to three biochemical geneticists for their work, carried on, in large part, with this orange-colored mold, *Neurospora.*"

INSIDE PLANTS

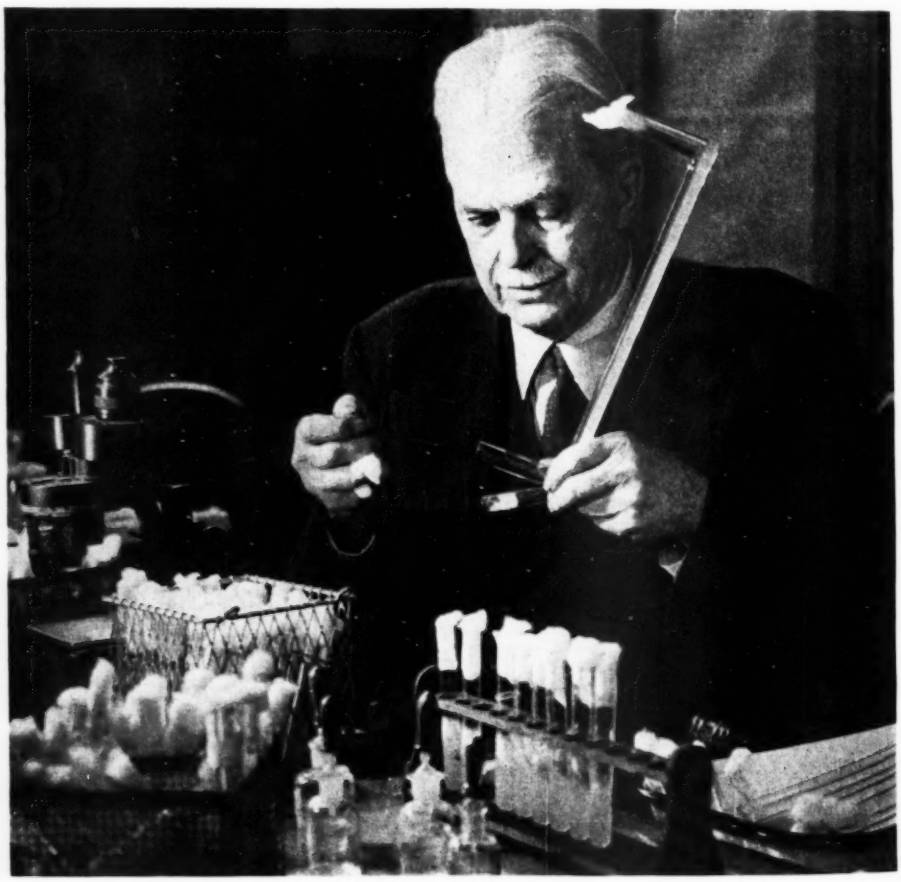
By Richard H. Bohning

Dr. Bohning is Assistant Dean of the College of Agriculture and Home Economics and Associate Professor in the Department of Botany and Plant Pathology at The Ohio State University. The following is based on talks he has delivered during short courses at the University and to garden clubs in central Ohio.

PERHAPS A CONVENIENT way of learning something of what goes on inside plants is to plant a seed and trace step by step some of the events that occur as the tiny embryo within the seed resumes growth and develops into a mature plant with seeds of its own. Of course, many of the plants with which you are concerned develop from cuttings rather than from seeds, but whatever is said about the inner working of plants will be true whether the plant in question developed from a seed or from a vegetative propagule.

The seed that we take from the packet appears as lifeless as a pebble, but beneath the seed coat evidence of life can be detected if one will make the right kind of measurements. Respiration, the process in which food is oxidized and energy is released, is occurring at a very slow rate. Why then has the embryo stopped growing? Some say it is resting, or perhaps a better expression, because I doubt if it ever got tired, is that it is dormant. Many conditions within or without the seed have contributed to cessation of growth. By now the internal conditions should be favorable to the resumption of growth, but the environment within the packet is not the usual habitat of a germinating seed. So let's take the seed and place it in a well-prepared seed bed—now if it ever wanted to rest, this is the place to do so. But when we look closely at the seed, we notice that a remarkable change is occurring. As it lies there in the bed, the seed begins to get bigger or we say it begins to swell.

If our vision would permit, we could see that water molecules have begun to diffuse from the soil into the seed, pushing apart the molecules of the seed



Bernard Ogilvie Dodge in his laboratory at The New York Botanical Garden

coat. We call this imbition, and it is the same phenomenon that causes boards to warp or doors to swell in damp weather. Water molecules pass on through the seed coat and enter the cells of the embryo — we call this process osmosis. Water entering the cells increases the water content or degree of hydration of the protoplasm, and respiration increases. Because the molecules of water have forced the molecules of the seed coat apart oxygen may enter more readily, contributing to an acceleration of respiration. The seed we say has now "come alive," but remember it was not dead. Respiration, the process most indicative of life and one which occurs in all living cells, is now occurring more rapidly, and signs of life are simply easier to detect. We have said respiration is the oxidation of food. Where, then, does the food used by this developing embryo come from? There is some in the seed—in the fleshy cotyledons of the embryo or in the endosperm surrounding the embryo, depending on the kind of seed we planted. In a corn grain, for example, starch accumulates in endosperm tissue. Digestion of starch can occur much as it does in our own mouths, and sugar is formed. This can not last for long because the seed was so small—certainly there was not enough food to last the plant all its life. But there is another source some people say—the soil—for when we prepared the seed bed we added fertilizer or "plant food." Let's take a closer look at what we added.

That bag of fertilizer was mostly inert material, maybe sand, to make a lot of bulk so we could spread the essential materials more uniformly. Are these essential materials really food? Let's examine them. We find many are the kind of chemical compounds the chemists call soluble salts; compounds containing the elements nitrogen, phosphorus, potassium, and others. Aren't these foods? When you reach for the salt shaker at the dinner table and sprinkle the steak or potatoes liberally, you would not say that you were adding food. Yet at least one of the elements in table salt is essential for the proper development of your body. If not foods, what then shall we call them? Why not the same as we call the substance in the salt shaker—salt? For example, a fertilizer material such as sodium nitrate can be correctly referred to as a nitrate salt.

Chemically these materials we add to the soil are not like the substance in the endosperm that is the initial source of food used by the developing embryo. We mentioned that there is starch in the endosperm that can be digested to sugar. Recall the potatoes on the dinner plate—we all know that potatoes contain a large amount of starch. When we eat the potatoes, starch is digested to sugar, and this can be oxidized in our bodies during respiration the same as in the young plant. There seems to be a basic similarity here between plants and man. Could it be that the things we call food for ourselves are also the foods used by plants? Yes, that is the case. The foods used by both plants and animals belong to the classes of compounds that are called carbohydrates, fats, and proteins. We all recognize that these substances are neither added to the soil, nor found floating in the air, nor present in the irrigation water. We sit down to three square meals a day to get our foods, and we eat plants or parts of animals which have eaten plants, but plants can not do this. If we do not add food to the soil in which the plant is growing, how then can it obtain the food essential to growth? The best explanation is that food is synthesized within the plant itself. How is this accomplished? Let's come back to this point in a moment, but first let's see what is happening to the plant before the source of accumulated food is depleted.

The seed germinated and, as the root emerged from the seed coat, it grew downward into the soil, and the stem started to grow in an upward direction. Why did the root grow down and the stem grow up? Certainly the plant did not know which way was up. Maybe some person, while facing the east in the full of the moon, planted the seed right side up. What would have happened if the seed had just been thrown into the ground any old way? The same thing—the root would grow down, and the stem would grow up. Why? Carefully conducted experiments have demonstrated that the direction of growth of roots and stems is controlled by the distribution of hormones known as auxins. If a plant is placed on its side, the roots will grow downward, and the stem will curve upward. Under the influence of gravity auxins accumulate on the lower side of the root and stem where they affect the rate of cell elongation. The concentration of these materials that promote growth is higher in the stem than in the root. Therefore, when auxins accumulate on the lower side of a root, they inhibit elongation of that side; the upper side of the root elongates more rapidly than the lower side. The uneven rate of growth in length of the two sides of the root causes the root to grow downward. After the root is oriented in a vertical direction, the distribution of auxins becomes uniform, and growth continues in a downward direction. The accumulation of auxins on the lower side of the stem has a promoting effect, and the stem curves upward. As growth continues, the roots penetrate deeper into the soil as the shoot emerges from the soil and heads skyward. By now the food reserves are nearly exhausted, but the plant will not starve because series of events are happening which make it possible for the plant to synthesize its own food. As the shoot emerged from the soil it became exposed to light, and the leaves and shoot became green as chlorophyll developed in some of the cells.

The process of making sugar that is known as photosynthesis can now occur. Carbon dioxide of the atmosphere enters the plant and finally gets into the cells containing chlorophyll. Water has entered the plant from the soil by way of the roots. Chlorophyll absorbs the light energy and in some way activates photosynthesis in which carbon dioxide and water combine, resulting in the formation of sugar containing chemically bound energy. Sugar can be oxidized in respiration and is also the initial material used in the synthesis of other foods. Fats can be synthesized from sugar in any living cell. You are all aware that this can also occur in your own bodies. When you go on a reducing diet, one of the first things

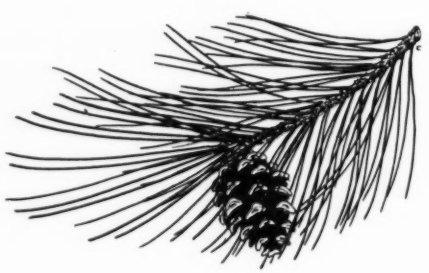
you omit from your daily menu is large amounts of carbohydrate. At this point one might ask, "Why add the minerals? I can't see where they are being used."

The mineral elements have many roles. For example, they are important constituents of the other class of foods, proteins. In the synthesis of proteins, which can occur in any living plant cell, sugar and nitrate, phosphate, and sulphate salts are utilized. Nitrogen and magnesium are constituents of chlorophyll which is essential to photosynthesis. Calcium salts of pectic acid are formed in the cell walls. Some of the mineral elements act as catalysts. Others have an effect upon permeability of cell membranes; other important roles might be enumerated. These elements are essential to the proper development of plants, and it is a necessary cultural practice to add them to the culture medium when adequate amounts are not available, but we still would not be correct in calling them foods.

The shoot of the plant appears to be able to synthesize its own food, but what about the roots? We have said that fat and protein synthesis can occur in every living cell of the plant; therefore these processes can occur in the roots. But where will the sugar come from that is the initial material utilized in both of these processes? The roots are underground, not exposed to light, nor do they contain chlorophyll; certainly photosynthesis cannot take place in them. This problem focuses our attention on a transport system that occurs within the plant. Sugar synthesized in the aerial portion of the plant is soluble and can pass from cell to cell. When sugar passes into the phloem of the stem, it can be translocated to the underground portions of the plant. The phloem is one of the tissues located in the outer part of a stem which you recognize as the bark on a woody stem.

The roots, then, are dependent upon the shoot for a source of sugar. If the tops of plants are kept removed, the roots will die of starvation. It is also interesting to note that a disease of elms, known as phloem necrosis, is associated with death of the phloem which prevents the movement of sugar to the roots; unable to synthesize sugar, they die of starvation. After death the roots decay, and water can no longer enter the plants at a rate which keeps pace with the evaporation of water from the leaves. The evaporation of water from the leaves—a process called transpiration—results in the loss of large amounts of water by plants. If the absorption of water by the roots of a plant does not occur so rapidly as transpiration, the plant wilts; and if transpiration exceeds absorption for an extended period, the plant will dry up and die, or we say the cause of death is desiccation. Since water is being lost so rapidly to the atmosphere by plants, it is necessary in our cultural practices that we continually add water to the soil—if nature does not provide enough to make up for these transpirational losses.

Why does transpiration occur if it often proves detrimental to plants and may result in their death? It occurs in the same way that water evaporates from an open pan. Water, like all substances, is made up of molecules which are constantly in motion, and they continually escape from the surface of the water and enter the atmosphere. There are also water molecules in the air, and the path of motion of some of these could land them in the pan. But since there is a greater concentration of water molecules in the dish than in the air, more water molecules will escape from the dish than enter it in any interval of time. So we see that whenever there is a greater concentration of a certain kind of molecule in one region than in another, the net movement of molecules will be toward the region of lower concentration of that kind of molecule. We then say that diffusion is occurring. Since these principles apply to all molecules, we know that they will diffuse from place to place irrespective of whether or not it will be beneficial to the plant. The diffusion of carbon dioxide into the plant may result in the continuance of photosynthesis which would be beneficial; but since the same physical laws govern the movement of water molecules, they will diffuse from the plant even though this may result in wilting.



We must be careful therefore, when we add mineral salts to the soil. Since they are soluble, they will dissolve in the water in the soil and reduce the concentration of water molecules surrounding the roots of the plants. If the concentration of water molecules in the soil is reduced, the rate of entrance of water into the roots will decrease; and a condition may result in which transpiration will be in excess of the absorption of water. Many of you have probably seen situations in which large amounts of fertilizer were applied to the soil and have heard the expression that the plants were "burned up." A more accurate explanation of what happened was that transpiration exceeded absorption, a water deficit caused the plant to wilt and dry up, and death from desiccation followed.

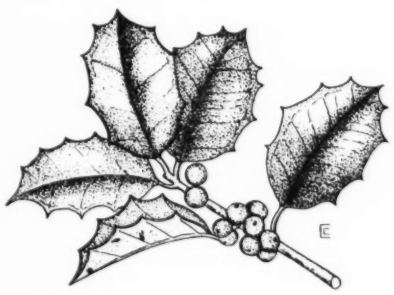
We can now readily understand that if conditions are maintained so that the plant is supplied with sufficient light intensity and a favorable amount of certain inorganic materials, the various processes will occur at rates which will result in satisfactory growth of the plant. Because of its effect upon numerous processes within the plant, temperature cannot be ignored and must be maintained within a favorable range. We can now visualize the activity going on within or around a plant. Water is entering the roots and moving upward through the xylem, the tissue that you call the wood in a tree, into the leaves and out into the atmosphere. All along the way some water is used in various processes going on in the cells. Carbon dioxide molecules diffuse into the plant and are utilized in photosynthesis. Sugar is synthesized. Some of it then passes from cell to cell, and some of it enters the phloem and moves downward into the roots. The sugar is then utilized in all the living cells in the synthesis of other foods. Some sugar is also oxidized, resulting in the release of energy, and still other sugar molecules are used in the synthesis of the substances of which the cells are composed.

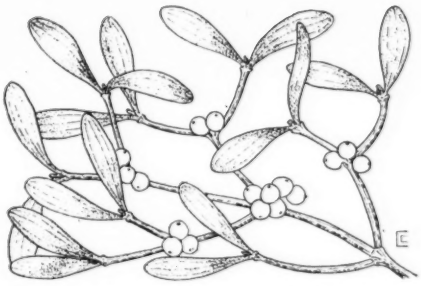
Oxygen enters the plant and is utilized in the oxidation of foods in the process of respiration. As more sugar is synthesized and moves downward into the roots, and as additional minerals enter the roots and move upward through the plant, the synthesis of ad-

ditional food occurs. As more food becomes available, more substances of which cells are composed can be synthesized, and continued growth and development of the plant occur. In order to conserve the amount of available sugar and direct its movement into one or two particular shoots, disbudding is often practiced. Here the lateral buds are removed so that large amounts of sugar will not be used in the development of shoots that will not contribute to the overall beauty of the plant, thus making more sugar available to the remainder of the plant. We see now that all parts of the plant are closely interrelated and considerable mutual dependence occurs between the various plant organs. A further illustration of this interdependence is the substance thiamine that is synthesized in the leaves and moves downward to the roots where it is essential to growth. In the plant this is a hormone, but you have probably purchased it at a drug counter under the name Vitamin B_1.

Here is another basic similarity between plants and man. The same substance which we call a vitamin and which is essential to us, is also essential to the growth of certain plant parts. As we learn more about what goes on in plants, we find that substances which we have classified as vitamins may have very similar roles to those substances we call hormones. Perhaps we should not try too hard to place these substances in separate pigeonholes but should develop a broader concept of these organic substances which, although they are not foods, are essential to the proper development of living organisms.

As the shoot elongates, we notice that branches are not developing from lateral buds near the lower part of the stem, but for the most part are occurring from buds in the upper portion. When the terminal bud is removed, branches develop from the lateral buds. This inhibiting influence of the terminal



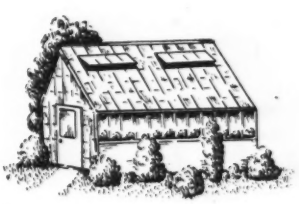


bud over the lateral buds is known as apical dominance and is caused by hormonal relationships. A common practice is to remove the terminal bud, or "pinch" the plant, thus eliminating the inhibiting effect of the terminal bud. This causes the development of branches from lateral buds and results in a plant of the desired form.

As growth continues, a large healthy-looking plant develops. It has taken a lot of time and energy to maintain the environmental conditions within a range that permits the embryo within the seed to develop into a mature plant. The plant looks fine, but there is one important thing missing. There are no flowers. Perhaps you have read about photoperiodism or learned through actual practice that the formation and development of flowers is controlled by the length of the light period to which the plants are exposed. If this was a chrysanthemum plant, we know that flowers would not develop unless the days were shorter than some critical length, and so we would begin each day to exclude light from the plants for the greater part of each twenty-four-hour period. We know that temperature within the dark period also has an effect upon the development of flowers in some plants, and so careful control of the temperature of the greenhouse within a certain range during the period of darkness is important.

Why should a change in the length of the day cause the development of flowers? We do not have all the answers yet, but the results of critical experiments permit us to draw a few inferences about what is going on. We know that the environment around a plant affects the development of a plant by first affecting some process which goes on inside the plant and upon which the observed behavior of the plant is dependent. In this case the observed phenomenon is flowering. What process inside the plant then is being affected which in turn causes the development of flowers? We find that if certain plants are exposed to a given photoperiod, they do not flower; but if exposed to some other photoperiod, flowering will occur. The question then arises, how much of the plant must be exposed to the favorable photoperiod before flowering will occur? In some plants only a small part of a single leaf need be exposed to the favorable photoperiod to cause flowering. Even more spectacular is the fact that in a certain species a single favorable photoperiod is sufficient to cause the development of flowers, even though the plants are thereafter exposed to day lengths in which they would ordinarily not flower. Another almost unbelievable happening is that if the dark period is interrupted with a flash of light of very low light intensity—about that from an ordinary flashlight—flowering is prevented, even though the total amount of light to which the plant is exposed is within the range which should cause flowering. Indeed, certain greenhouse operators have reported that the light from the headlamps of passing automobiles has in some instances prevented flowering. What is happening within the plant that light could have such a profound effect? The actual sequence of events is not known at the present time. It is postulated that a substance(s) is synthesized in the blades of the leaves and moves to the stem tip where it causes the development of flower parts. The substance must be present in very small quantities, and therefore it is inferred that it is a hormone; in fact it has been called the flowering hormone and some have given it the name "florigen." None of this substance has as yet been isolated from plants so its exact nature cannot be stated.

We have followed a number of events that occurred in the life of the plant that developed from the hypothetical seed we planted a few pages earlier. The plant has now flowered, and subsequently pollination and fertilization will occur, resulting in the formation of fruits and seeds. Thus the life cycle of our mythical plant is completed.



TAXONOMY, AN UNFAMILIAR NAME FOR A FAMILIAR GARDEN ACTIVITY

By **Caroline K. Allen**

Dr. Allen is Visiting Research Associate at The New York Botanical Garden.

TAXONOMY IS THE classification and identification of plants. It is as simple as that. Much time and effort go into taxonomy at The New York Botanical Garden. To show its importance and its close relationship to other garden activities, I must give a bit of background and describe a few of the methods used in this study.

A number of cities have an arboretum or botanical garden which has grown with the years and become a part of their way of life. As St. Louisans delight in The Missouri Botanical (Shaw's) Garden and Bostonians in the Arnold Arboretum, so do New Yorkers in The New York Botanical Garden.

Two kinds of work go forward in these institutions: the first, and more obvious, results in the landscaped gardens and other areas filled with the beauty of growing things; the second, less obvious but equally important, comprises scientific research.

The first comes under the general head of horticulture, well known to all visitors from the amateur plant grower to the professional horticulturist. They enjoy the ever-changing garden and greenhouse displays, which are outward manifestations of the superb cultural techniques practiced in the propagating range under the direction of Louis Politi, Horticulturist. From time to time they have glimpses of this basic work in the pages of *The Garden Journal*. Very often these are illustrated by photographs taken by E. N. Mitchell, Staff Photographer. Many other plants come to life in these pages through the sure hand of Charles C. Clare, Jr., Staff Artist, who is in great demand for technical illustrations as well. Visitors to the Garden read the books and news articles of T. H. Everett, Assistant Director (Horticulture) and Curator of Education.

Horticulture shares with research in the introduction into cultivation of new plants, which add beauty to the landscape and increase the large number of those already useful in daily living. New plants have been brought into America in several ways. The first settlers raised from seed many herbs from "home," that are now associated with the so-called "colonial garden." Native American plants, some already in use among the Indians, soon became popular abroad. European botanical gardens eagerly sent their own material to our botanical institutions in exchange for these novelties. Many seeds and cuttings from the Old World thus found their way to our gardens.

In our own country, the westward extension of the railroads sparked an interest in exploration which has continued to expand, until today search for plants includes large-scale collecting in tropical America.

The era of plant exploration initiated in the United States may be roughly divided into three periods. The first began with the naturalists who accompanied fur-trading expeditions into the West and continued with the early governmental and railroad surveys which carried naturalists or botanists commissioned to bring back plant and animal collections, minerals, and other items of scientific interest. The Lewis and Clark Expeditions and the Pacific Railroad, as well as the geological and boundary surveys*, yielded an abundance of new plants. Many a plant discovered on these trips bears a scientific name commemorating the explorer who collected it; *Lewisia* and *Clarkia* come to mind. Dr. John Torrey, acknowledged leader in New World taxonomy, did much in his time to further exploration of the West. In turn, Professors Asa Gray and Charles Sprague Sargent of Harvard continued to promote this activity during the period that ended about 1900.

The second period began at the turn of the century and lasted—again, by an arbitrary division—about twenty-five years. During this interval, the greatest number of plants came from temperate

Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, and the author discuss a new species of *Ocetea* collected by the Maguires on the 1953 Guayana Expedition of The New York Botanical Garden on Serrania Yutajé, Rio Manapiare, Territorio Amazonas, Venezuela.

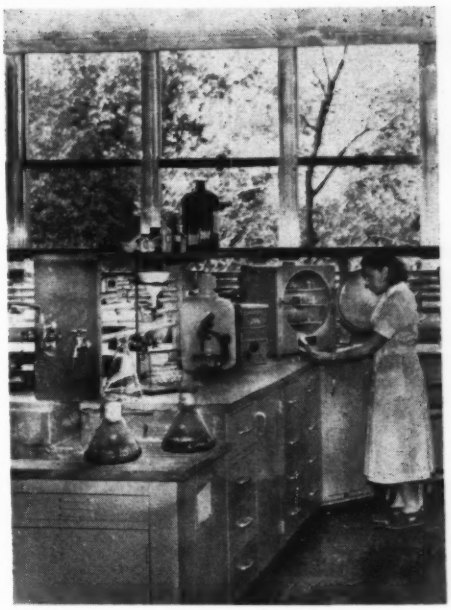
eastern Asia. Because the climate of this region, exclusive of the tropical and subtropical sections, is comparable to that of the eastern United States, we find in our gardens today many species native to eastern Asia. It is interesting to note that certain groups, although they consist of different species, are common to both areas. The rhododendrons and magnolias are illustrations. Among the prominent collectors of these decades was the late Dr. Ernest H. Wilson, one-time Keeper of the Arnold Arboretum, whose books record plant hunting in the Orient. Another is Dr. Joseph F. Rock, whose fantastic experiences would make excellent reading, could he be persuaded to write about them.

The third and last era, overlapping to some extent the second and spreading into the present time, has been less fruitful as far as producing plants for our gardens is concerned, but far more so from an economic standpoint; for explorations have latterly been pushing into regions other than temperate. In the American tropics, economic interests as well as the purely scientific have been motivating forces, particularly during and after World War II. The United States Department of Agriculture has concentrated especially in this field, and we owe much to its foresight. Among the largest explorations at present are those going forward in northern South America under the auspices of The New York Botanical Garden, with Dr. Bassett Maguire the coordinator and leader. In the economic area, Dr. David J. Rogers, Curator of Economic Botany at the Garden, was actively engaged in the organization of the Society for Economic Botany. *The Journal of Economic Botany*, initiated by Dr. Edmund J. Fulling, Honorary Curator, is now the official organ of the newly founded society and is published by the Garden for the society.

When seeds and cuttings are brought into the country, the usual procedure is to try them out for possible landscape as well as economic use. They are put through many types of tests: soil, temperature, climate, and so on, until the optimum situation for growth and production is determined. Once the new plants are proved satisfactory, they are distributed to cooperating nurserymen throughout the country, who in turn make further tests. Eventually a new plant is introduced to the public through seed catalogues or flower shows, and another exotic blooms in our gardens and greenhouses or appears on the market as a delectable food. This sounds simple and extremely productive. Actually, a large percentage of the newcomers is never seen in cultivation for one reason or another. In spite of these casualties, however, vast numbers of plants have been introduced into the United States. This does not necessarily mean that they may not have been cultivated in the region in which our collectors found them, in some bygone or recent era. In fact, it is rather generally believed that the plants from eastern Asia that flourish so satisfactorily in our climate were brought into cultivation in their native lands, perhaps centuries ago.

Among the more than four thousand Arnold Arboretum introductions into cultivation during the past eighty-five years are the graceful beauty-bush *(Kolkwitzia amabilis)*, the striking Chinese variety of the Japanese dogwood *(Cornus kousa chinensis)*, the colorful Korean and torch azaleas *(Rhododendron yedoense poukhanense* and *R. obtusum kaempferi.)*

A second source of cultivated plants is the science of genetics or selective breeding. Botanists are constantly striving to produce hybrids that will be larger than their parents, more hardy, more disease-resistant, and perhaps more economical to grow. The geneticist has improved the quality of food for our tables—apples, corn, avocados, to name a few—and has enriched our gardens. The forsythia hybrid *(Forsythia spectabilis)* with spectacularly large blooms came into being by chance a few decades ago at the Arnold Arboretum during breeding experiments. We owe, too, the long-blooming flowering cher-



Dr. Annette Hervey, Research Associate, in the Research Laboratory of The New York Botanical Garden.

ries and ornamental crabs to the precision and expert methods of the geneticist. The results of the late Dr. A. B. Stout's hybridization of daylilies (*Hemerocallis*) are seen in many gardens.

An important research that of necessity keeps abreast of horticulture is plant pathology, the study of plant diseases, their prevention and their control; a science of inestimable value for landscape beauty as well as economy. Dr. P. P. Pirone, Plant Pathologist at The New York Botanical Garden, who has written several books on the subject, is constantly consulted by gardeners interested in growing healthy plants.

Research is going forward continually under the supervision of Dr. Richard M. Klein, Alfred H. Caspary Curator, in the plant physiology laboratory completed within recent years. The program initiated by Dr. William J. Robbins twenty-five years ago paved the way for current work with antibiotics and vitamins.

So much for the work of botanical gardens that has eye-appeal, horticulture, and that has an obvious practical application, physiology and pathology. Now to the less conspicuous but highly important research of taxonomy. The history of taxonomy, and its development, is an absorbing story in itself, and one that deserves to be and I hope will be presented at a future date. Early man showed great interest in and curiosity about his surroundings. Enter-

* Lewis & Clark's Travels to the source of the Missouri River and across the American continent to the Pacific Ocean, 1804-1806.

United States: **Bureau of Topographical Engineers**
Report of exploring expedition from Santa Fe, New Mexico, to the junction of the Grand and Green Rivers of the great Colorado of the West in 1859, under the command of J. N. Macomb.

Secretary of the Interior
Report on the United States and Mexican Boundary Survey, 1859.

War Department
Reports of explorations and surveys, to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean, 1853-(6).

And many others.

Dr. David J. Rogers (left), Curator of Economic Botany, compares roots of varieties of tapioca (*Manihot esculenta*) in the field in Jamaica during a recent collecting trip.

prising individuals among the ancients who practiced the art of healing with herbs undoubtedly, by word of mouth, passed down names for the plants they used. The era of herbals contributed its share towards classification. It has been said that taxonomy, as we understand it today, began with the system of classification presented by the Swedish botanist Linnaeus.

Two branches of taxonomy are open to the student, and it is his individual temperament that prompts his choice. Broadly speaking, if he is the type of person who wants to know a little about a lot of different things, he will choose what is known as floristic work. He may take his own home, let's say Scarsdale, New York, and work intensively to discover and record every plant native to that township. His published work will be a Flora of Scarsdale. Or if he is ambitious, he may cover the entire county and produce a Flora of Westchester County; or even —though this would usually be far beyond the experience and capacity of the tyro—a Flora of New York State. Good regional floras, for which The New York Botanical Garden is celebrated, are extremely valuable. Through the years many have appeared under the authorship of staff members: *An Illustrated Flora of the Northern United States, Canada and the British Possessions,* by Nathaniel Lord Britton and Addison Brown; *Flora of the Southeastern United States,* by John Kunkel Small; *Flora of the Rocky Mountains and Adjacent Plains,* by Per Axel Rydberg, all of which have been revised and edited at least once. The tradition has been continued in recent times with Dr. David D. Keck's (Head Curator, 1950-58) collaboration on the *Flora of California.* Dr. Arthur Cronquist, Curator, wrote Volume V (1955) and the major portion of Volume IV (1959) of *Vascular Plants of the Pacific Northwest,* a much-needed contribution. *The Botany of the Guayana Highlands* by Dr. Bassett Maguire and collaborators is appearing serially.

On the other hand, if the taxonomist is less prone to spread his energies, he will select a single group of plants (a genus or a family), perhaps the gentians or saxifrages of the world. He will study this group of plants exhaustively to learn as much as possible about their characteristics and their relationship to other groups. He will determine how many different species occur and how they differ. Before he describes and names a plant that he believes to be new, he must be very sure that it is not merely an extreme variation of a known plant caused by an extreme environment. We may recall the strikingly different appearance of a common weed, cropped by animals in pasture, or cut by the lawn mower, as opposed to the aspect of the same kind of weed growing undisturbed, protected perhaps by a fence or a wall.

The study of taxonomy is carried on for the most part with the aid of a good botanical library and herbarium, both of which are found at botanical institutions throughout the world. The New York Botanical Garden offers excellent facilities of this type for the student, particularly one interested in research on American plants. The Library of over sixty-four thousand bound volumes, not to mention some three hundred and fifty thousand pamphlets, is under the care of James Daly, Administrative Librarian. Miss Elizabeth C. Hall, Sarah Gildersleeve Fife Research Librarian, whose general public knows her as "Miss Information," aids professional botanists also in many important ways.

In close connection with the Library is the work of the Bibliographer and Acting Assistant Director (Botany), Dr. Harold William Rickett, who is Editor of the *Memoirs,* the organ that carries the research of the staff. The Garden also publishes *Brittonia,* organ of The American Society of Plant Taxonomists. Dr. Rickett is closely associated with the International Association for Plant Taxonomy (headquarters in The Netherlands), which symbolizes world-wide importance of taxonomy.

The second requisite for the study of taxonomy offered by the Garden is the Herbarium (a collection of dried plants arranged systematically by families and used for reference) of approximately 2,790,000 specimens under the supervision of Dr. Bassett Maguire, Head Curator.

An herbarium built up by careful selection is an invaluable reservoir of information. The scope of any herbarium is essentially a reflection of its personnel and their various interests. At New York, Dr. Britton's concern with West Indian plants led to a large collection from that area; Dr. Small added material from the southeastern United States and Dr. Rydberg from the Rocky Mountains and Great Plains. When China was opened to the West, Dr. E. H. Wilson, pioneer collector, laid the foundation for eastern Asiatic

collections which, augmented through succeeding years, made Harvard's Arnold Arboretum one of the leading institutions in Oriental botany. Specialists in various plant families are frequently responsible for large numbers of their particular groups. Dr. H. A. Gleason, specialist on Melastomes, accumulated thousands of sheets of *Melastomataceae* at The New York Botanical Garden; as a result of the zeal of MacKenzie, a student of *Carex*, the Garden offers abundant material for research on this genus. And so on.

An herbarium may be accumulated in three major ways other than by special collections: by subsidy, purchase, or exchange. An institution may send out an expedition in search of plants or may contribute jointly with other institutions towards a project for collecting in a given area. A particular collection may sometimes be purchased outright from an institution sponsoring an expedition, or from a professional collector. Often young botanists will finance a summer in the field by collecting plants from a little-explored area and selling sets to botanical centers. The experience of identifying his summer's collection, as well as the actual field work, is good training for the student.

A third way of building up an herbarium—and this is often the most important — is by exchange with other institutions. A set of the Maguire Venezuelan material at The New York Botanical Garden may be offered in exchange for a set of Panamanian plants from The Missouri Botanical Garden. The Royal Botanic Gardens at Kew may send a duplicate set of Thailand plants to Harvard in exchange for a set of the Archbold New Guinea collection. Needless to say, keeping records of the exchange balance involves a considerable amount of detail. At The New York Botanical Garden all incoming and outgoing specimens—exchanges, purchases, gifts, and loans—pass through the hands of the Custodian, Frank C. MacKeever.

Small collections, usually from amateur botanists, are received as gifts. Many come in at random from interested individuals for identification. I should like to urge anyone sending plants for identification to choose a specimen adequate for study. An adequate specimen is: a twig or branchlet which has either flowers or fruit, preferably both, *attached;* and leaves, *attached.* Before the branchlet (which should be 6-8-10 inches long, depending on how much is necessary to show attachment of leaves, flowers, and/or fruit) is sent, it should be pressed until dry between sheets of newspaper under a heavy weight. A book or a stone will keep an even pressure. For professional collecting, or for a permanent herbarium, the technique is more complicated, but for the purpose of identification, this will do. The size of the plant, shrub, or tree should be stated, if known, and the color of flower, fruit, and leaves. The date of collection and geographical location are essential. It is helpful also—and cuts down the time and effort of the taxonomist—if the sender states whether he found the plant growing in a garden or wild; in the sun or shade; in a moist, damp patch of ground or on a dry, rocky hillside—environment again. By furnishing this information, the sender will be sure of a more prompt and more accurate determination, to say nothing of the gratitude of the often unknown taxonomist who is trying to help him. Even at best, identification may often be difficult, as E. J. Alexander, Associate Curator, can testify. Mr. Alexander is the "botanical Sherlock Holmes" who does a large part of the identification for the Garden's public. As is very evident, the taxonomist spends much of his time in routine herbarium work.

For his research he must have access to a large, well-organized herbarium, with the privilege of borrowing supplementary material for study from other institutions if necessary; he needs as well the facilities of a good botanical library, both already mentioned. An adequate hand lens is essential for studying the outward characteristics of plants, such as hairiness. For a more minute examination of floral parts a compound microscope should be available and a set of dissecting tools to prepare those parts for study.

The personal equipment of the taxonomist must include a thorough knowledge of Latin, the universal language of botany since medieval times—the botanical "esperanto," one might say. According to the International Rules of Botanical Nomenclature, an original description of a new-found plant must be published in Latin in order that its name be valid. A reading knowledge of French and German is necessary, since a large portion of taxonomic work was done in Europe in

In this group of orchids in the Propagating Range of The New York Botanical Garden are plants brought back by Lincoln Adderly from the Garden's 1958-59 expedition to northern South America. These include species of *Catesetum* (right) not yet identified and *Galeandra devoniana* and *G. lacustris* (left).

the nineteenth century. Today the student of Latin-American plants needs to add Spanish and Portuguese to his linguistic accomplishments.

A study of ecology, which I mentioned as the relation of a plant to its environment, gives the taxonomist a better understanding of variation in plant structures. An acquaintance with the principles of allied sciences is important: geology for its basic contribution toward plant distribution; paleobotany for its phylogenetic implications. Each of these plays its part in promoting a fuller understanding of plants in general and enables the taxonomist to cope more adequately with his research problems.

The study of plant anatomy is an aid to taxonomy when used in conjunction with it. The taxonomist studies the easily seen characteristics of leaf, stem, flower, and fruit. The anatomist, a botanical John Gunther, gets "inside" and studies their internal structure—the vascular system which conducts fluids in plants. Many students frequently use both these phases of plant science to corroborate their findings.

A study of pollens (palynology) and cellular structure (cytology) will often give the taxonomist a clue to the identity of a plant and its relationships.

Has taxonomy any practical value? Why should its study be important to our way of life?

It is obvious that it is of value in providing correct names for use in horticulture and plant breeding; in pathology, for often the infecting organism is specific for a given plant; and in forestry, particularly for timber trees growing in newly developed regions and as yet untapped for commercial use. The search for oil in modern times has been aided considerably by the identification of pollen found in the substratum in various areas. The presence of the pollen of certain key species is known to be an indicator of the presence of petroleum oil.

In connection with geology, a need for taxonomy of a different type has arisen as the result of an increasing interest in paleobotany. The Garden's collection of fossil plants is currently being reorganized and new flora added by Dr. Herman Becker, Visiting Research Associate.

The problem of allergies has been brought to public attention during the past decades, and many of the treatments depend on the correct identification of plants used for the purpose. The current interest in antibiotics has pointed up the need for accurate naming of the plants so involved. The isolation of reserpine, a tranquilizer-antihypertensive alkaloid, from *Rauwolfia serpentina* instigated a taxonomic revision of the genus *Rauwolfia* by Joseph Monachino of The New York Botanical Garden staff. Mr. Monachino also gave a much-needed name to the *Strophanthus* variety that yields a high percentage of sarmentogenin, that extremely valuable compound suited for conversion to cortisone. The taxonomy of *Ryania,* source of an insecticide, was clarified also by this same botanist.

In addition to the important taxonomic research on the flowering plants, mention should be made of the significant studies that go on under the supervision of Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium that houses those plants that produce neither flowers nor seeds—the mosses, algae, fungi, and so on. The medical and economic application of studies of the latter are well known. The late Dr. B. O. Dodge, in his classical studies of *Neurospora,* laid the foundation for experiments in genetics during the decades that have followed. Only a few strains of one of the many species of the fungus *Penicillium* yield the important drug penicillin. The part of the taxonomist is obvious in this instance.

A few years ago, an adulterant discovered in cigarette tobacco was identified at the request of the Pure Food and Drug Commission, thus preventing a wholesale poisoning of smokers. A New England farmer's pure-bred cattle were dying from an unknown poison, presumably from a pasture weed. The botanist discovered the poison-hemlock (*Conium maculatum*) to be the culprit. This type of identification has become standard procedure for the taxonomist through the years.

In the preparation of condiments, accurate determination is especially important. Under the general trade name of "oregano" there may be a single variety or a combination of any of the forty-four different varieties of the species involved, each adding its special flavor for a specific use. A knowledge of the plant that supplies each is obviously necessary. The same is true of curry. No two curry powders are ever alike in composition, for all are mixtures, each to be used in a special dish. One may elevate the lowly egg to a concoction for the gourmet's delight; another may enhance the flavor of an otherwise mediocre veal casserole.

Many immediate problems arising in daily life have been solved by the taxonomist. The State of Massachusetts was planning a new game preserve and wished to establish deer from Alaska within its acres. What food would the deer require in order to thrive in their new habitat? Because deer are ruminants, this presented no difficulty. A couple of dozen were killed, and the contents of their stomachs sent to the taxonomist for identification. Among other plants, twigs of the northern willow were still recognizable.

A few years ago, attention was focused on an old will which had been disputed between two heirs in Canadian

(Continued on page 217)

Students of a class in field botany collect specimens for identification and mounting.

Heavily fruited specimen of *Pyracantha* 'Graberi'.

The Cultivated Pyracanthas

By

Francis de Vos

Dr. de Vos is Assistant Director of the National Arboretum, Washington, D. C.

FIRETHORNS ARE by far the most colorful shrubs in the autumn landscape of the southeastern states. Briefly challenged by the autumnal foliage of a myriad of deciduous shrubs and trees, they outlast their competitors and remain the cheeriest plants in the drab landscape of early winter. No garden in areas where they can be grown should be without at least one specimen of the firethorns.

The genus *Pyracantha* to which they belong is closely related to such genera as *Cotoneaster, Crataegus,* and *Mespilus,* and has been assigned at different times to one or the other of these genera. The genus is also closely related to *Osteomeles,* with which it has been hybridized to produce the monotypic bigeneric or hybrid genus *Pyracomeles* and the hybrid species *P. vilmorini* (*Pyracantha crenato-serrata* x *Osteomeles subrotunda*). The genus *Pyracantha* can be readily distinguished from these closely related genera, but it is difficult to distinguish between the different species and cultivars of *Pyracantha.*

Let us take a closer look at the six species of *Pyracantha* that are in cultivation in this country to see how they differ.

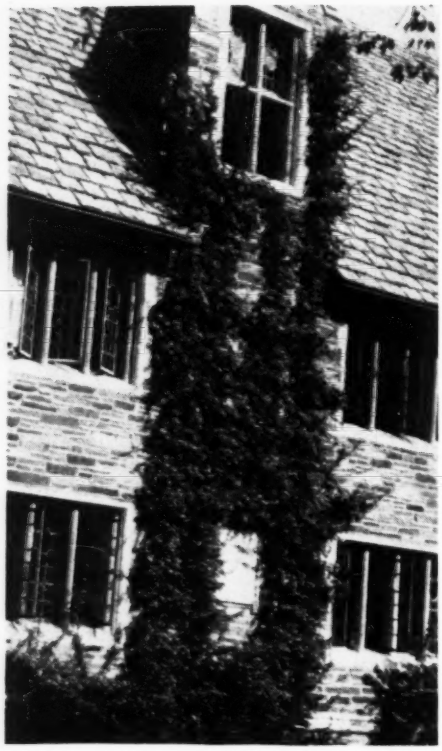
Pyracantha augustifolia is native to China and is perhaps the most tender of the species. The tomentose condition of the under surface of its leaves and of its calyces clearly set this species apart from the others, which are essentially glabrous. Typically a broad-spreading shrub which reaches a height of ten to twelve feet, it does on occasion produce some prostrate branches. Its fruits are orange-yellow and flattened on the ends.

Pyracantha atalantioides, also native to China, makes a very strong upright-growing shrub fifteen to twenty feet in height. This species is frequently referred to as the Gibbs firethorn (*P. gibbsii*), because it was named after the Hon. Vicary Gibbs in whose garden in England there was a magnificent specimen. Later nomenclatural studies, however, revealed that *P. atalantioides* was the first name given to this species and should take precedence over *P. gibbsii.* The most distinguishing features of this species are its leaves which are larger than those of other species, ranging up to three inches in length, and the long-lasting quality of its fruits. The bright red fruits are said to stay in good condition until late winter.

Pyracantha crenato-serrata (P. yunnanensis) is closely related to *P. atalantioides* and can best be distinguished from it by its leaves. These are widest above the middle, toothed, and green beneath, whereas those of *P. atalantioides* are widest at or below the middle, usually without teeth, and slightly glaucous beneath. *P. crenato-serrata* is native to Yunnan Province, China; it was introduced into France in 1906.

Pyracantha crenulata is native to the temperate regions of the Himalayas. Although it is probably more closely allied to *P. coccinea,* from which it differs by its glabrous instead of pubescent corymbs, it may be more frequently confused with *P. crenato-serrata.* It differs from the latter in that its leaves

Pyracantha 'Rosedale' trained as a standard.



Espaliered plant of
Pyracantha coccinea lalandii.

are less rounded at the apex. The fruits of this species range from orange-red in the typical variety to yellow in the variety *(P. crenulata) flava.*

Pyracantha coccinea, especially the hardy upright form *P. coccinea lalandii,* is the most widely grown of the species. It is native to southern Europe and Asia Minor and makes a typically broad-spreading shrub up to about twenty feet in height. It can be distinguished from *P. angustifolia* in that its leaves are only slightly pubescent beneath. The fruits of the species are bright red and those of the more popular *P. coccinea lalandii* are orange-red.

Pyracantha koidzumi (formerly *P. formosana* and sometimes still listed as such) is the most widely grown species in the southeastern states. This Formosan species is only precariously hardy in Washington, D. C., and is not usually found in northern gardens. Its bright-red fruits are borne in great profusion and last until early spring if left unmolested by birds. It can be distinguished from *P. crenato-serrata* by the lack of teeth on its leaves and from *P. atalantioides* by its smaller leaves, which are green beneath.

Although the species seem to be reasonably distinct, it is difficult and frequently impossible to determine the true identity of specimens growing in our gardens, that is, to which species to assign them. There are four reasons for this: (1) the true species are rarely grown; (2) plants raised from seeds of open-pollinated flowers are variable in foliage and habit, and seeds from red-fruited varieties often give rise to yellow- or orange-fruited forms; (3) since the chromosome number is probably the same for all species, seeds collected from plants growing in collections containing more than one species are likely to give rise to interspecific hybrids which are intermediate to both parents in many of their characteristics; (4) the color and size of fruits can differ markedly under various cultural and light conditions.

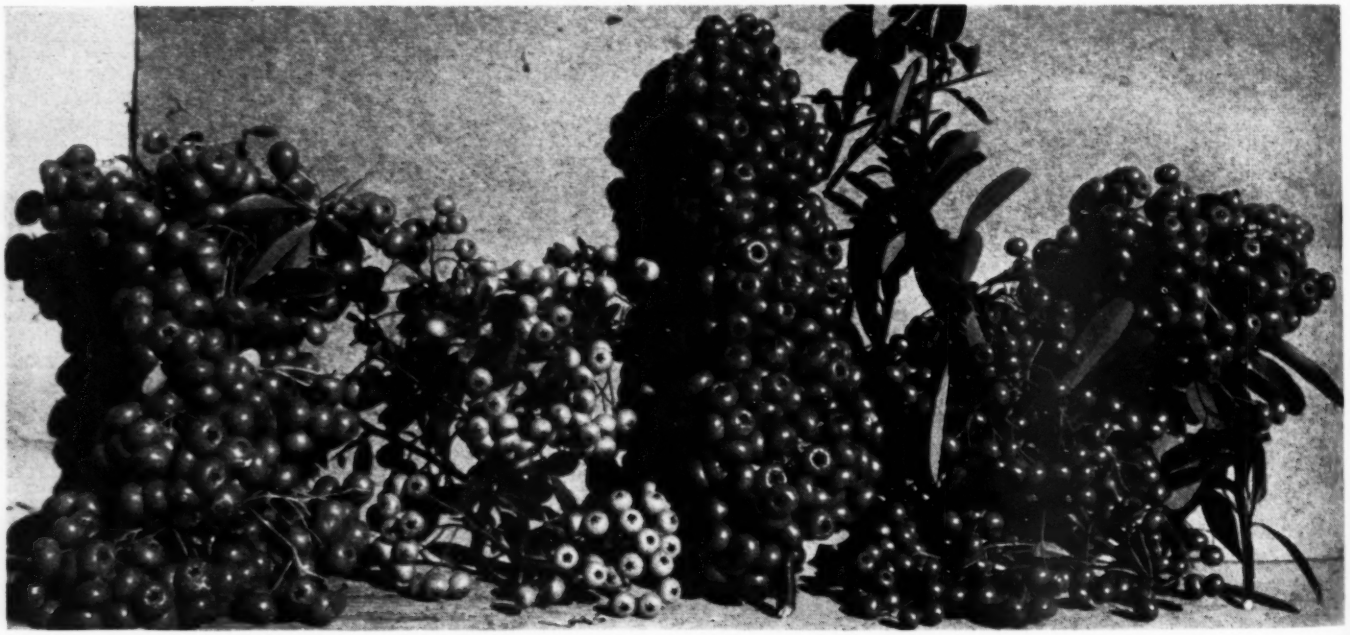
The biggest obstacle to the successful culture of the firethorns was removed with the advent of can culture. The firethorns had a notoriously bad reputation, and justly so, for being difficult to transplant and establish. This problem has virtually disappeared since can culture and the technique of growing them in wire baskets have become standard nursery practice.

For maximum flowering and berry production, full sun is required. However, in areas where a particular variety is known to be on the border line of hardiness, a compromise site in which there is full sun part of the day and some winter shade will minimize winter burn of the foliage. Careful observations on the changing patterns of shadows around the grounds may reveal suitable sites.

The firethorns will grow in a wide range of soil types and acidity as long as the soil is well drained. They will not tolerate "wet feet."

Some pruning is usually required to develop reasonably compact plants. The four-to-five foot long shoots that frequently develop after the second year should be headed back by half their length just before growth in the

Fruiting clusters (left to right) of *Pyracantha* 'Graberi', *P. koidzumi splendens,* and pyracanthas 'Pride of Rochester', 'Rosedale', and 'Victory'.



spring, or their tips can be cut out when their growth is half complete. It should be kept in mind when pruning that flowering and fruiting occur on short spur-like branches that were formed during the previous growing season. Removal of this growth by pruning or winter-killing of branches with spur growth means the loss of berries for a year.

The most troublesome problem in growing firethorns is the control of insects and diseases. Sudden wilting of new shoots in late spring may be a symptom of bacterial fire blight. The diseased shoots should be cut out, and a spray of the antibiotic streptomycin applied at flowering time. Scab disease may be recognized by the presence of unsightly black scabs on leaves, twigs, and berries. It may be controlled by a spray of ferbam applied when buds break in spring and repeated twice at ten-day intervals. Infestations of the hawthorn lace bug frequently become serious enough by late summer to turn the foliage to an unsightly silvery brownish green color. Three applications of malathion spray at ten-day intervals, starting when the buds begin to swell in the spring, will usually clean up a bad infestation. Infestations of scales may be kept under control by spraying with dormant oil spray in early spring before growth starts.

It is not possible at this time to evaluate fully the different varieties separately for use on a country-wide basis, because test collections have not been established in the various climatic regions across the country. Information is, however, accumulating as individuals and nurserymen try the newer varieties in their particular areas.

FRUIT COLOR AND HARDINESS RANGE OF THE MOST COMMONLY CULTIVATED FIRETHORNS

Name	Fruit Color	Hardiness Zone*
Pyracantha:		
angustifolia	orange-yellow to red	7b
atalantioides	red	6b
(*P. gibbsii*),		
(*P. discolor*)		
'Bakeri'	red	6b
'Belli'	red	8
'Cal Poly'	red	8
coccinea	red	6b
aurea	yellow	6b
'Government Red'	red	6b
'Kasan'	orange-red	5
lalandii	orange-red	5b
'Monrovia'	orange	6
'Sensation'	red	5
'Thornless'	orange	5
'Lindleyana'	orange	6b
pauciflora	orange-red	5
crenato-serrata	red	7b
(*P. yunnanensis*)		
'Graberi'	red	7b
'Rosedale'	red	7b
crenulata	orange-red	6b
'Crimson Tide'	red	6b
flava	yellow	6b
kansuensis	orange-red	6b
rogersiana	reddish orange	6b
aurantiaca	reddish orange	6b
" *flava*	yellow	6b
taliensis	yellow	6b
'Duvali'	red	7b
'Ingleside Crimson'	red	6
koidzumi	orange-red	8
(*P. formosana*)		
'Eddie's Coral'	red	8
'Low Dense'	orange-red	8
'San Jose'	red	8
'Santa Cruz'	red	8
'Santa Cruz' prostrata	red	8
'Stribling'	red	8
'Victory'	red	8
'Walderi'	red	8
'Walderi' prostrata	red	8
'Oxford'	orange to red	7b
'Pride of Portsmouth'	red	7b
'Runyan'	orange-red	5

Approximate Range of Average Annual Minimum Temperature of Each Zone

Zone 1	Below −50° F	Zone 6	−10° to 0°
Zone 2	−50° to −40°	Zone 7	0° to 10°
Zone 3	−40° to −30°	Zone 8	10° to 20°
Zone 4	−30° to −20°	Zone 9	20° to 30°
Zone 5	−20° to −10°	Zone 10	30° to 40°

*The numbers refer to the *Plant Hardiness Zone Map.*

When the suffix b is used with a number, it indicates that the plant is hardy only in the warmer part of a Zone. The map is an adapted version of a color map and is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Price, 15 cents. [Misc. Publ. No. 814]

TAXONOMY (from page 214)

courts for years. The land in question was to be divided at that point on the banks of the St. Lawrence River where the salt-water tide stopped. This unsatisfactory division gave one of the heirs about four times more land than the other. It was the pleasant task of the taxonomist consulted to inform the court that at the time the will was drawn up, the tide had come up the river to the exact point that would divide the property in half. Proof? Certain plants that still grew along the banks of the river would never be found there, if the tide had not at some time washed them with salt spray. And so a feud of long standing was settled amicably.

Taxonomy contributes directly to such branches of plant science as ecology. As a by-product of his current geographical and cytological work on arctic mosses, Dr. William C. Steere, Director of The New York Botanical Garden, notes that the moss carpet of this region serves essentially as a differential heat trap. In the summer, the dry moss insulates the soil and in winter allows the heat to escape. For this reason, the ground remains permanently frozen—a condition known as "perma-frost."

These more or less spectacular reports are only incidental in the life of the taxonomist. His major work is, and will continue to be for some time to come, the routine classification, identification, and revision of plant groups important, in the broader sense, in modern living. It is this work that forms a significant part of the Garden's many activities.

Some Outstanding Annuals

By **T. H. Everett**

"Coltness Hybrids" are very pleasing dwarf dahlias.

Mr. Everett is Assistant Director (Horticulture) and Curator of Education of The New York Botanical Garden.

IN EARLY AUGUST I visited the trials of flower garden annuals at the State of New York University, Long Island Agricultural and Technical Institute, at Farmingdale, Long Island. Vaughan's Seed Company cooperated with the Institute in staging these trials.

Rarely have I seen as interesting a collection of annuals in such splendid condition. It occurs to me that the notes I made on the day of my visit may interest readers of *The Garden Journal*.

Almost six hundred varieties, representing about fifty genera, were included in a planting which extended over what must be about two acres. For the most part, they were sown in rows spaced three feet apart.

Of especial interest to me was the section devoted to 1960 All-America trials. Elsewhere in the trial plantings many previous All-America winners were displayed.

Zinnias were so numerous and so good that it was difficult to make a selection. I liked 'Sunny Boy', a cactus-flowered variety, for its strong growth, stout stems, and four-to-five-inch wide, deep yellow flowers. Another cactus-flowered variety, 'Rosalind', with deep rose-pink flowers as large as those of 'Sunny Boy', also showed to good advantage. 'Blaze' with smaller flowers, three to four inches in diameter, is a true cactus-flowered type; its brilliant orange-scarlet blooms are of fine quality.

In the All-America Selections section, an outstanding zinnia was "Gaillardia-flowered Mixed." This newcomer is two feet tall, has good stems and foliage, and flowers that surely bear a strong resemblance to double-flowered gaillardias. This, partly because of the shape of the blooms, which are two and a half to three and a half inches across, and partly because each flower is zoned by having the lower halves of its "petals" deep rose or red in contrast to the pale pink or yellow ground color.

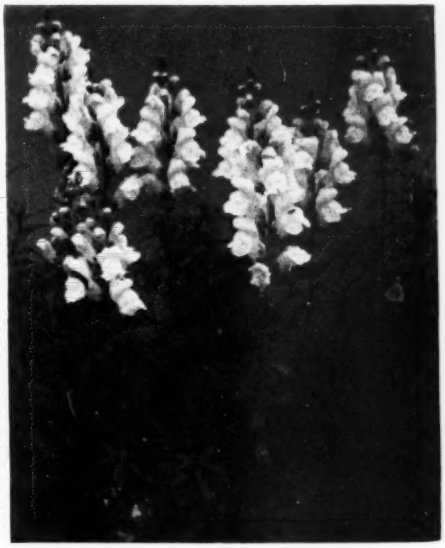
A zinnia labeled 'Semi-dwarf Bright Orange' and one labeled 'California Giant Orange King' promised well. Both have brilliant-colored large blooms; those of the California Giant are almost red and those of the other tangerine-orange.

The verbenas were mats of kaleidoscopic color. With the exception of 'Calypso', which incidentally was much taller than any of the others, there was no hint of the muddy hues (even in the mixtures of blends) that were not uncommon years ago. 'Dwarf Crystal' is a pure white of good substance and has exceptionally rich green, firm foliage. 'Dwarf Delight' is similar but has clear medium-pink flowers, each with a white eye. 'Dwarf Dazzler' belongs in the same low-growing group and has flowers of a brilliant red.

Petunia 'Aztec' in the All-America Selections trials is a good newcomer. Very similar to the older variety 'Comanche', it appeared to be a slightly brighter red, but this may be because of a small but conspicuous yellow eye in the center of each bloom which by contrast intensifies the red.

Rudbeckias 'Double Yellow', 'Starlight', and 'Gold Flame' in the order named.

Coleus 'Candidum'.



Snapdragon 'Summer White'.

Lonas inodora 'Goblin'.

Petunia 'Linda' is a pale pink edition of the previous All-America winner 'Coral Satin'. The new variety 'Mercury' is the clearest blue petunia I have ever seen—sky-blue perhaps best describes the color of its single flowers. Both are first class. 'Silver Blue' stood out as one of the best of the bedding varieties. Its single flowers are of a uniform blue somewhat paler than those of 'Mercury'. Of blues verging slightly towards purple, 'Neptune' is good albeit a little lanky for bedding; better, perhaps, for window and porch box planting.

Women visitors to the trials thought highly of petunia 'Sugar Plum'—and so did I for that matter. It has fine substance and withstands stormy weather well. Its single flowers are rather small, upturned, and pink spotted with crimson-violet and with a throat and central "star" of the same plum hue.

A rich purple-leaved sweet basil, which has tiny flowers, attracted my attention in the All-America trials sections. Its leaves have the typical flavor. Planted next to the good single-flowered, clear pink All-America Selections trial petunia 'Linda', it was very effective.

African marigold 'Toreador', an All-America winner, still ranks with the best. Its flowers are clear orange, but apart from coming true to color, they appeared no finer than those produced by a row labeled "Climax Mixed" which included both orange-flowered and yellow-flowered plants.

"Petite Master Blend" of dwarf French marigolds pleased me. The plants were six to eight inches tall and a foot or so in diameter. Each carried an adequate number of well-shaped, double flowers an inch and a half in diameter and varying in color on different plants from clear yellow through orange to deep bronze. The flowers were not so profuse as to hide all the foliage, which is an advantage to my way of thinking.

Near the "Petite Master Blend" were rows of color-selected varieties of this strain. These were:

'Petite Orange', tangerine-orange, 'Petite Harmony', chestnut and orange, 'Petite Gold', golden-yellow, and 'Petite Yellow', clear yellow; all were remarkably true to type.

Celosia plumosa 'Forest Fire Improved' is remarkably uniform with handsome rich purplish red foliage and large plumes of crimson flowers. The plants were two to three feet high. The "Lilliput" varieties of celosia 'Fire Feather', crimson-scarlet, and 'Golden Feather', clear yellow, are not quite uniform, but nevertheless they are good low-growing bedding selections. They are about eighteen inches high and form fine bushy specimens.

Of the cockscomb varieties, celosia 'Toreador' impressed me as being exceptionally good. The plants were eighteen inches high, and each carried a fine large comb of brilliant crimson.

Rudbeckia 'Starlight' is gorgeous.

Celosias 'Toreador', "Lilliput Varieties" and 'Forest Fire Improved' in the order named.

Zinnia "Gaillardia-Flowered Mixed."

Its blooms are mostly semi-double, but this characteristic is not fully fixed and in a small percentage of plants the doubling is not so pronounced. 'Starlight' grows two and a half feet high and has flowers four inches or more across. They are glowing golden-yellow with a purple-brown central cone. This new variety is an improved selection of rudbeckia 'Double Yellow'.

Rudbeckia 'Double Yellow', an All-America winner, is essentially the same as rudbeckia 'Gloriosa Daisy', but the flowers have more petals and are more or less semi-double.

Rudbeckia 'Gloriosa Daisy' has flowers four and a half to five inches in diameter, deep golden-yellow with purplish brown cones. The flowers are informal and a little floppy.

It is interesting to reflect that 'Gloriosa Daisy', 'Double Yellow', and 'Starlight', are successive selections of tetraploids of our native *Rudbeckia hirta,* the black-eyed Susan.

Rudbeckia 'Gold Flame' is excellent. It is fifteen to eighteen inches high and carries masses of single flowers, each three inches or more in diameter. Its purplish cone is prominent. The rays are deep golden-yellow with a chestnut blotch.

Of dwarf dahlias, "Coltness Hybrids" (all singles, fifteen to eighteen inches high), "Extra Dwarf Mixed" (semi-doubles, fifteen to eighteen inches high), and "Unwins ××× Hybrids" (semi-doubles, two feet high), are very worthwhile and all exhibited a fine mixed selection of colors.

Coleus 'Velvety Rainbow', with red leaves, and coleus 'Candidum', with yellow and green leaves, are low bushy varieties which I thought especially handsome.

Salvia splendens 'Bonfire' is one of the best red-flowered varieties for beds. The variety 'Rocket' has very heavy spikes of red flowers which do not greatly exceed its foliage and is dwarf and compact. With more graceful and more open spikes, and more of them, salvia 'St. John's Fire' attracted attention as a good red-flowered bedder. Among off-colors 'Violet Flame' is outstanding. Its flowers, abundantly borne, are deep purple-violet. This would make a fine contrast planted near salmon-pink petunias or verbenas.

Phlox drummondii 'Tetra Glamour', an All-America winner, has very large clear pink blooms which deepen in color around the small central white eyes. 'White Beauty' and 'Crimson Beauty' are good compact varieties; their names describe their colors.

Snapdragon 'Summer White' was making a brave show. The plant is of medium height; the flowers, pure white and of good substance, are arranged in close shapely spikes.

Dianthus 'Fire Carpet', an All-America winner, is exceptionally good. Plants grow a foot tall and as much through and are almost hidden by masses of single bright crimson-red flowers.

Prominently labeled "Yellow Ageratum Goblin", a row of an old-time annual excited comment. This "Yellow Ageratum" is *Lonas inodora,* a native of the Mediterranean region and sometimes called by the inappropriate name of African daisy. Its yellow flowers may be dried as an "everlasting" for use in winter.

Wax begonia 'Red Perfection' makes low mounds and has small slightly bronzed leaves. This is a truly outstanding variety.

Among pink wax begonias, 'Pink Pearl' and 'Thousand Wonder Rose' were notable and, as far as I could see, practically identical.

Very distinct among the *Vinca rosea* varieties was 'Rose Carpet'. This has spreading, prostrate stems and large purple-rose flowers; the petals are darker towards their bases. Individual plants were two feet in diameter and six or seven inches high at the time of my visit to Farmingdale.

Verbena hortensis var.

FERTILE AND SHOWY HYDRANGEAS

By **Joseph C. McDaniel**

Mr. McDaniel is Assistant Professor in Horticultural Research at the University of Illinois, and President of the Northern Nut Growers Association. From his boyhood, spent in the Tennessee Valley of northern Alabama, he has been interested in native hydrangeas.

Among other woody ornamental plant selections soon to be introduced from the University of Illinois are a blue ash with exfoliating bark; a nearly non-fruiting, compact-growing, corky-barked Ohio buckeye; some hollies and magnolias.

AMONG THE AMERICAN species of *Hydrangea,* the shrubby smooth hydrangea, *H. arborescens L.,* has the widest distribution in the wild, ranges the farthest north and west (and to six thousand feet up Mount Mitchell), and has been the one most frequently cultivated, at least in America. While *H. arborescens* maintains itself both by means of seeds and by natural layering in shaded woodland sites, it is easily multiplied vegetatively, and seeds are seldom planted by nurserymen to propagate it. As with most of the other cultivated species of *Hydrangea,* the vegetative means of propagation have been employed for forms with more than the typical numbers of showy-sepaled ray flowers.

Cultivars so far introduced in this species were originally found as variants in the wild. The most widely clonally propagated of the *H. arborescens* cultivars was first taken to gardens from a southwestern Ohio location before 1900, and in 1907 described as *H. arborescens* forma *grandiflora* (A. G. Hill) Rehder; it was formerly called "Hills-of-Snow" but now is most commonly listed as 'Snowhill' in current nursery catalogs. Rehder and most recent authors have described it as having all its flowers sterile (without pistils), though Fernald (*Gray's Manual of Botany,* eighth edition) keys this and his two other described showy-flowered forms as having "all or essentially all flowers sterile and radiant."

These other "all sterile" forms in the species have received botanical descriptions, the first apparently without ever being established in cultivation, though its name has at times been misapplied to 'Snowhill'. It is *H. arborescens* var. *oblonga* forma *sterilis* (Torrey and Gray) St. John, which was collected at Wysox, Pennsylvania, by John Carey one time before 1840. A second form that differs from it in having more pubescent foliage was published in 1921 as *H. arborescens* var. *deamii* forma *acarpa* St. John, based on a herbarium collection made in 1910 by B. F. Bush in woods at "Monteer" (probably Montier, Shannon County), Missouri. One large wholesale nursery in 1960 lists this form under its synonym, *H. cinerea* var. *sterilis.*

The published descriptions are in error, at least on the sterility of the 'Snowhill' or forma *grandiflora,* and probably of other forms in *H. arborescens* and other species. Typically fertile flowers do occur, though they are easy to overlook except at anthesis and unless the large-sepaled, longer-pediceled ray flowers that comprise the larger part of most flowerheads are pried apart. Not one all-sterile-flowered head of *H. arborescens* could be found in a number of Illinois towns and cities where I observed thousands of plants, belonging to various clones and seedlings, during June and July 1960.

My observations disclosed something else unexpectedly—the presence of three other clones distinct from 'Snowhill', which also have a considerable per cent but not all of their flowers showy-sepaled. One was growing at a single Springfield location. The other two, apparently previously unrecorded in either botanical or horticultural publications, are already in rather extensive cultivation by amateur growers in various parts of central and southern Illinois, and possibly other states. These two are being given cultivar names and will shortly be available from nursery sources, since they differ enough from each other, and each is sufficiently better in habit than 'Snowhill', that they may well replace much of that popular cultivar in future propagation.

These 1960 studies of the flowering habits of the shrubby hydrangeas were inspired first by the discovery of an apparently all-showy-flowered plant of *H. quercifolia* Bartram in Etowah County, Alabama, on January 11, 1960. (Attempts are being made to propagate it.) Later, in April 1960, a casual inspection of last year's flowerheads on a 'Snowhill' bush at Urbana, Illinois, disclosed numerous opened and apparently mature seed capsules produced by primary and lateral terminal flowers. Though it was presumed that if these had matured seeds, most of them would have been dispersed during the winter, the capsules were pulverized and sowed on moist sphagnum under a polyethylene enclosure. Seven seedlings from this source are growing and should flower in 1961. These results led to more detailed examination of the flowering cymes of various *Hydrangea* species, botanical varieties, and cultivars outdoors during summer, and in the herbarium of the Department of Botany, University of Illinois. My cultivar collections in *Hydrangea* are now included in this herbarium.

'Snowhill', whenever it was examined at many Illinois locations during its 1960 flowering, invariably had cymes with almost twenty per cent of perfect flowers typical of the wild *H.*

Upper. *Hydrangea arborescens* 'Champaign' growing by the trunk of a green ash. Lower. Leaf form of *H. arborescens* 'Champaign'.

arborescens. Many of the ray flowers also produced pollen and appeared to have functional, though undersized pistils; these often had a single style rather than two, though some appeared to have the styles fused but with two stigmatic surfaces. Some may even produce fruits which will grow to maturity, as did occasional ray flowers on plants of the wild type seen in the herbarium. (All the ray flowers of a var. *oblonga* clone cultivated here produced fruits in 1960.) Others abscise above the showy sepals without opening their true petals (the latter are mostly in fours, rather than in fives as found in the typical "fertile" non-radiant hydrangea flowers). The showy sepals persist, in any case, and tend to hide most fruits which may develop from either type of flower. Since the showy ray flowers turn to face downward after the time of anthesis, the tendency is to mount them in this reversed position on herbarium sheets; this further obscures any fruits that may have developed from the not always "sterile" ray flowers.

Torrey and Gray in 1840 *(Flora of North America)* noted that "sterile" flowers in the species *H. quercifolia* were often staminate. A number of other species, in addition to *H. arborescens,* also have ray flowers that bear pollen. Since they may also bear pistils, and even sometimes produce fruits, it would seem incorrect to continue calling them sterile without qualification. They are not totally sterile even in the taxonomic sense, but are rather of reduced fertility compared with the smaller, non-showy-sepaled flowers that have been previously categorized exclusively as "fertile."

The three other showy-flowered *H. arborescens* clones now found in cultivation in Illinois and western Indiana bear more of the typically fertile flowers than does 'Snowhill'. Clone Illinois 1, now registered under the cultivar name 'Champaign', bears between forty and forty-five per cent of such flowers in average cymes. Clone Illinois 2, now registered as 'Annabelle', bears about thirty-three per cent of such flowers. At its Springfield location, the third clone, Illinois 3, has between sixty-five and seventy per cent of typically fertile flowers. Occasionally cymes are found on bushes of 'Champaign' with as few as five per cent of radiant flowers. (This clone is possibly a chimera.)

Both 'Champaign' and 'Annabelle' appear to have been in cultivation in two or more Illinois counties for at least the past thirty years, without attracting the attention of any local ornamental nurseryman. Meanwhile, their offsets were being passed along to more and more amateur cultivators, sometimes in mixture with 'Snowhill'. I first noted 'Champaign' in the town of that name, where later inquiry revealed that a plant grower named Harry La Selle had been propagating it during the 1920's and recommending it as a form which stood up better than 'Snowhill'. The widow does not remember who gave Mr. La Selle his start of the clone. I have seen it as far west as Springfield, Illinois, and southeastward to Vincennes, Indiana, but it appears to be in heaviest concentration in the twin cities of Champaign and Urbana.

'Annabelle', now most abundant in and near Anna, Union County, Illinois (I saw it in seventy yards), has twice been brought to Urbana, first directly from Anna, and much later from Kinmundy, which is in the fourth county north of Anna. It is to be seen in smaller numbers in other towns between Anna and Kinmundy and as far west as Belleville, where the mother of the present cultivator brought it from a friend's yard in New Athens. I have seen 'Champaign' no farther west than Springfield, and neither it nor 'Annabelle' was found in Cairo, Illinois, thirty-seven miles south of Anna, in a survey made in early July 1960.

This considerable dispersal by private planters, before forms are taken up by commercial nurserymen, is reminiscent of the early history of the clone now called 'Snowhill', reported in *Horticulture* (1906-1908) by the late E. G.

Right. Hedge of *Hydrangea arborescens* 'Annabelle' at Urbana, Illinois.

Below. *H. arborescens* 'Annabelle' with flowers at various stages of development.

Hill, nurseryman of Richmond, Indiana. His firm was the commercial introducer of 'Snowhill' in 1906.

Mr. Hill noted that his introduction was growing before 1906 from near Kokomo, Indiana, to Allegheny City (now part of Pittsburgh), Pennsylvania, and "was widely scattered by private individuals through a stretch of country embracing Dayton, Piqua, Springfield, and Yellow Springs, Ohio." There were at that time in Ohio, he wrote, "a number of bushes in Dayton, Yellow Springs, Urbana, Springfield, and Piqua. Some, or in fact most of them, are quite ancient, judging by appearances." C. S. Sargent, in a letter to *Horticulture* (Feb. 15, 1908) verifying the distinctness of Hill's clone from the much older forma *sterilis* of Torrey and Gray, also noted that "in the Gray Herbarium there is a specimen of *Hydrangea arborescens grandiflora* collected at Nashville, Tennessee, without date or name of collector."

W. R. Van Dersal in *Ornamental American Shrubs* (1942) pictured, from an unnamed location in the wild, a still different *H. arborescens* clone in which "the flowers are all showy." Referring to the "variety *grandiflora*", he wrote that this "was found wild several times before 1900 and has been 'discovered' several times since . . . The one defect of this variety is that in some plants—but not all—the flower heads become so heavy that the stems cannot hold them erect." This defect ("mop-like" heads, in the words of Bean of Kew) applies particularly to 'Snowhill' plants fitting the 1906 picture published by Hill in *Horticulture* and the descriptions given in 1907 and 1908 by Rehder and Sargent for forma *grandiflora*. Consequently, I regard 'Snowhill' *(grandiflora)* as properly a cultivar consisting of a single clone. Forma *sterilis* (T. & G.) St. John is a different clone (possibly extinct by now, though a search in Bradford County, Pennsylvania, might be rewarding). The three other showy-flowered forms now cultivated in Illinois are clones that differ from the preceding and from each other, not only in percentages of typical fertile flowers but in other respects. Under the present rules of nomenclature, they and any additional forms of horticultural interest (including some of Van Dersal's "not all" plants, if cultivated) should receive non-Latin cultivar names, together with adequate descriptions to distinguish each of them from the commonly cultivated and currently nursery-propagated 'Snowhill' or *grandiflora*.

'Champaign' (clone Illinois 1), besides having more than twice as many typically fertile flowers, differs from 'Snowhill' in having darker green leaves, with less uniformly cordate bases, and more strongly growing stems (occasionally to six feet in one year) which hold its flatter-shaped flowerheads erect. Its ray flowers are about half as broad as those of 'Snowhill', and their sepals are not so acutely tipped. Except that it has more than forty per cent of non-radiant flowers, it greatly resembles the descriptions published for forma *sterilis*. It is a better plant than 'Snowhill' for landscaping and appears generally more vigorous. At Champaign and Urbana, Illinois, it usually bears flowers in quantity over a longer season than does 'Snowhill'. If clumps are allowed to become too thick, flowering is less abundant on new stems.

Under good culture, 'Annabelle' (clone Illinois 2) bears the most impressively showy flower heads I have seen among American species of *Hydrangea*. On new growth from established plants that have been cut back to the ground, the flowerheads are often one foot in diameter and approach a spherical outline much more closely than those of other clones. The plants have cordate leaves, larger and of darker color than those of 'Snowhill'. They have not been seen growing side by side with 'Champaign', but in Urbana they appear to average less in annual stem growth. The stems are stronger than those of comparable age on 'Snowhill,' and hold the large flowerheads more nearly erect. 'Annabelle' can readily be distinguished from 'Snowhill' by its shorter, more broadly oval sepals on showy flowers; these also have longer pedicels than most flowers of the latter. It seems to be a few days later in opening its first white flowers, and, like 'Champaign', may ordinarily remain in a showy condition longer than 'Snowhill'. It has somewhat fewer stems than 'Champaign', but as many or more than 'Snowhill', in clumps of comparable age. Both of the newly named cultivars appear to thrive somewhat better than 'Snowhill' in sites exposed to full sun, but in common with other forms of *H. arborescens* are likely to grow better in a northern or eastern exposure under central Illinois conditions. They will grow well beneath tall trees if the soil is fertile and the water supply sufficient.

Clone Illinois 3 is not yet available in sufficient quantity for introduction, and may not be worthy of introduction in competition with 'Champaign'. From the latter cultivar it differs in having fewer ray flowers on typical cymes and in shorter sepals on such flowers. Its leaves are generally cordate.

Additional cultivars originating as seedlings from the not-so-sterile showy forms of *H. arborescens* may be expected in future years. Controlled crosses can be made on the species, though the removal of stamens (advisable because the species appears self-fertile) is a rather tedious process, after the ray flowers have been cut out. Crosses with other hydrangeas are possibilities, since most of them that have been studied (by Karl Sax and some Japanese workers) have reportedly identical chromosome numbers. (Exceptions are *H. paniculata grandiflora* and *H. paniculata praecox,* both tetraploid.) One hybrid of *H. arborescens* with the silverleaf hydrangea, *H. radiata* Walt., was grown in Europe long ago; this cross could be repeated with a showy-flowered form as one parent.

It may even be possible to get hybrids with the flower colors of some of the Asian species and the hardiness of *H. arborescens*. Anyone who is interested can try open-pollinated seedlings of 'Snowhill' or one of the newer clones I have described. Gather the seed capsules as soon as they are mature in the fall, sow them as you would petunias in the spring on sphagnum or sterilized soil, and by the next year you may have some interesting new types flowering.

SPECIAL SHOWS

in the Conservatory of The New York Botanical Garden

NOVEMBER 5, 1960

Chrysanthemum Show opens and will continue through December 11, with favorable weather conditions.

DECEMBER 16, 1960

Christmas Show opens and will continue till January 6, 1961.

HOLLY IS MY WORLD

By **Ambrose Brownell**

Silver plane holly, *Ilex aquifolium argentea marginata.*

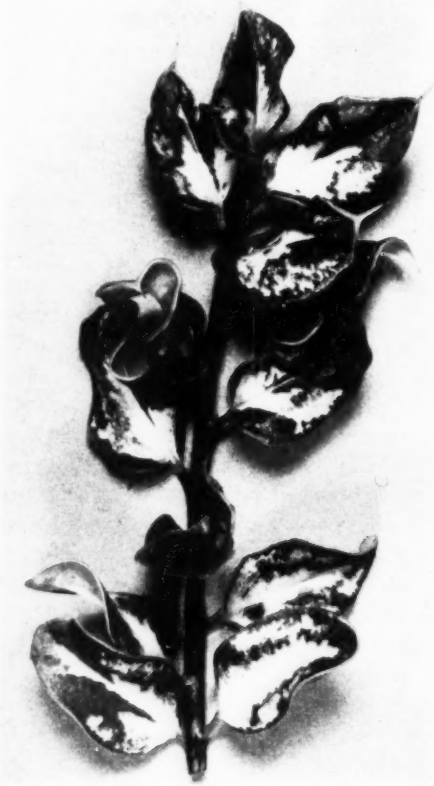
Mr. Brownell is widely known as collector, propagator, and grower of hollies. His father, the late Senator George C. Brownell, planted one of the first commercial groves of English holly in the Pacific Northwest. Mr. Brownell is a member of the Advisory Council of the U. S. National Arboretum and actively interested in the Holly Society of America. He is presenting a collection of the more winter-resistant Brownell hollies to the New York Botanical Garden.

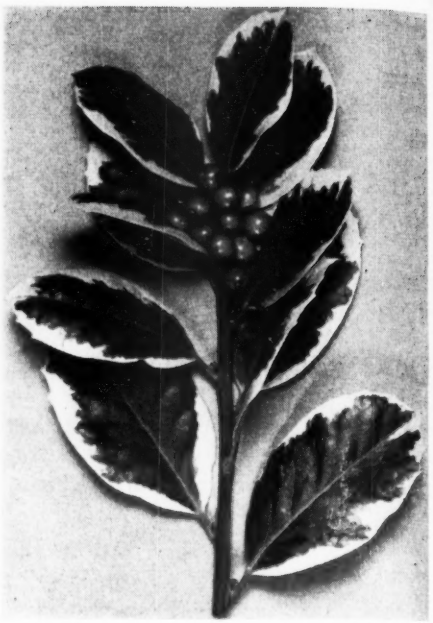
THE REALITIES of one's life may often be traced to the most nebulous and fanciful daydreams. This is true of our arboretum of the hollies of the world. Ever since Father Brownell planted some four hundred English hollies back in 1910, to be weeded and tended on weekends and during school vacations, I have become increasingly holly conscious. Since I lived first with my father's hollies and, as the years flew by, with the thousands upon thousands added to our groves and nursery plantings, it was only natural that the study and collection of hollies from all over the world should have become my very life. With the assembling of the hollies has come the opportunity to introduce many original selections and improved varieties, and to assist in popularizing the planting of the ever beautiful hollies across America.

The commencement of this fascinating and challenging enterprise came about through sheer curiosity. Living in a region long famous for English hollies, I sought to collect as a hobby the different green and variegated types that I had observed here and there throughout the Pacific Northwest. It proved to be a delightful task, as holly owners everywhere were most generous in furnishing starts and cuttings, and I soon came to learn of the camaraderie that exists among garden enthusiasts. Even huge exotic specimens discovered on some of Portland's older estates were bought outright and moved to the arboretum. The most spectacular of these acquisitions was an ancient silver weeping holly *(Ilex aquifolium argentea marginata pendula)* hemispherical in shape, ten feet high and fifty feet around—now the pièce de résistance of the entire arboretum.

Before long my quest led me to England, where with the help of the Secretary of the Royal Horticultural Society I was placed in touch with the following nurseries, some far more than a century old: Hillier & Sons, Winchester; Fisher, Son & Sibray Ltd., Sheffield; Walter C. Slocock Ltd., Woking; J. Waterer, Sons & Crisp Ltd., Bagshot; W. Fromow & Sons, Windlesham; J. Smith & Sons, Darley Dale. Equipped with official unrestricted import licenses from the U. S. Department of Agriculture (now no longer available), I placed orders for three to five hollies of every named species and variety available. During 1947-1948 hundreds of hollies—many duplicates, of course — came through quarantine safely all the way to Oregon in huge packing crates, some weighing half a ton. What excitement, what an unbelievable array of diverse and fantastic hollies, mostly from Europe, and the Canary, Balearic, and Madeira Islands, yet many that had originated in China, Japan, India, and even America. The doors flew wide open to a whole new insight into the genus *Ilex,* as the hollies were planted and multiplied for safe keeping. Even cuttings from famous English hollies were flown in by air post; these were protected from drying out enroute by the use of orchid tubes.

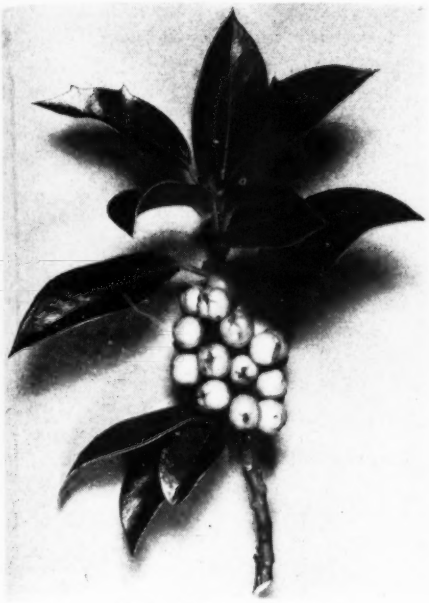
Golden screwleaf holly, *Ilex aquifolium crispa aurea.*



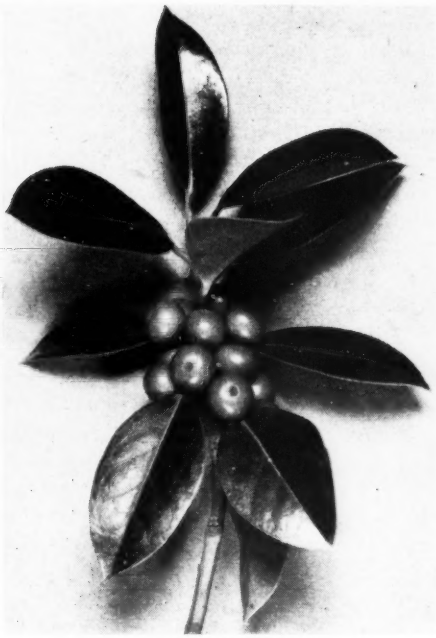


Golden queen holly, *Ilex aquifolium aurea marginata.*

Plunged overnight from a modest hobby into a big-scale holly-growing project, and one receiving national publicity, I soon found myself overwhelmed with requests for listings and data about our new-found treasures. Correctly cataloging and describing the hollies proved to be an even greater challenge than the chore of collecting them had been. Fortunately, our efforts were well received, and over twenty



Holly 'Orange Gem'.



Holly 'Royal Red'.

Holly 'Berigold'.

thousand catalogs, illustrated in color, were mailed upon request to holly fans across America.

While our major business today is the growing and distribution of carloads of Oregon-grown Christmas holly from more than a hundred acres of commercially cultivated groves of superior horticultural varieties, my time is largely taken up by welcoming visitors to our holly arboretum and by corresponding with "pen pals" who have been bitten by the holly bug. Here I should mention the Holly Society of America that has carried out a highly commendable program for encouraging interest in the growing and care of hollies.*

At the Brownell Farms in Oregon the dreams of yester year are crystallizing into fulfillment. Pictures are being painted, not in oils, nor on textiles or ceramics, but on sweeping lawns studded with specimen hollies spaced at random: a section of gently rolling ground for the glossy-leaved aquifoliums from Europe, a southern slope for the North American species interspersed with native oaks, and a grassy valley embroidered with the dwarf crenatas and other curious hollies of the Orient. The scene abounds in color: leaves of green, silver, and gold; berries of orange and yellow, even of

*The dues are a nominal $3.00 per year payable to Charles A. Young, Jr., Secretary, Bergner Mansion, Baltimore 16, Maryland. Membership include copies of the printed proceedings of the semi-annual meetings at which papers are presented by professional as well as lay authorities.

Ilex aquifolium angustifolium.

black, with the predominate reds in every imaginable shade.

Well over three hundred hollies, each differing from the other, have been assembled to date to provide pleasure and instruction for those who seek the beautiful and unusual. Our unique and extensive holly arboretum has long been a center of attraction for local garden clubs, and a mecca for visitors from near and far who wish to see and learn about hollies. Those with whom we have been privileged to share our hollies find that they grow not only in the soil but in the affections of their owners as well.

The Pacific Northwest, and specifically a narrow belt lying between the Cascade Mountains and the Pacific Ocean, a scant one hundred miles in width by six hundred in length, is a land of natural charm and ample rain. Verdant with evergreen flora, America's greatest region of virgin timberlands alternately basks in sparkling sunshine or is bathed in the gentle rains known locally as Oregon mist. English hollies, grown from seeds shipped around the Horn over a century ago, have rooted and flourished in this mild and temperate climate ideally suited to their requirements. The history of the Oregon country and its heritage of hollies from England a full century ago is a stirring story in itself.

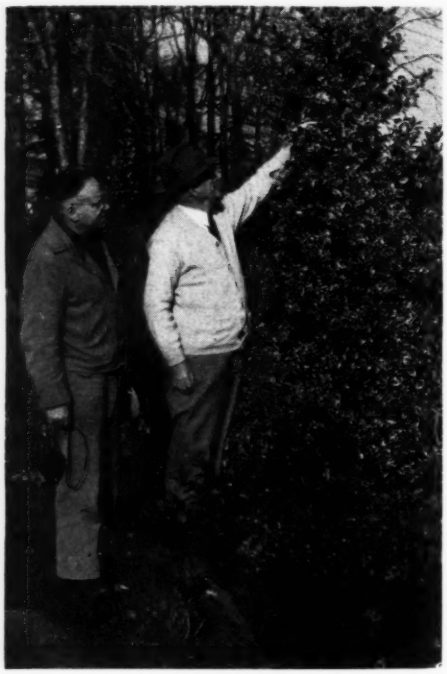
Fortunately for today's holly enthusiasts, England's nineteenth-century gardeners were possessed not only of fabulously green thumbs, but of an un-

derstanding of and intense love for their native hollies. To further stimulate interest in hollies, annual shows were held at which England's foremost horticulturists competed for the prizes that were awarded for introductions of exceptional distinction and beauty. Vieing with one another, English nurserymen sought far and wide to extend their collections of species of *Ilex* from foreign lands, including the native American hollies.

Cooperating with the enthusiastic nurserymen in the search for new and exotic varieties were the willing hollies themselves, ever prone to mutate in bud and in seed. Almost chameleon-like, the English hollies proved to be the most versatile of all the species in changing their habits of coloration and growth. As long ago as 1874-1876 the English *Gardeners' Chronicle,* in a monumental monograph by Thomas Moore, illustrated and described over one hundred and fifty named garden varieties or cultivars of English holly *(Ilex aquifolium).* This noteworthy treatise was followed by the publication in 1908 of *Holly, Yew & Box,* a truly masterful effort to catalog the known hollies, as well as boxwoods and yews, by William Dallimore, while he was keeper of the arboretum of the famed Kew Gardens in Surrey.

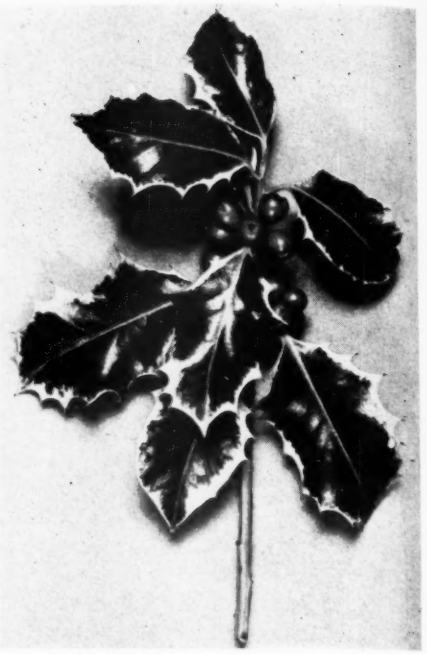
The next serious effort to perpetuate the history and lore of the hollies came almost fifty years later with the publication in 1953 of Dr. H. Harold Hume's book entitled *Hollies.* A still more recent authoritative compilation of data and information on holly is found in the special issue (January 1957) of the *National Horticultural Magazine*: this was edited by Harry William Dengler of the University of Maryland. Other able scientists who are now contributing to the knowledge of the hollies are: Dr. Shiu-ying Hu, associated with the Arnold Arboretum and specializing in the hollies of the Orient; and Dr. William F. Kosar, with the U. S. National Arboretum in Washington, D. C., famous for his work in plant breeding and especially in holly hybridizing.

The author, Ambrose Brownell, and Dr. H. Harold Hume examine *Ilex aquifolium argentea marginata* or silvary holly.



Many species compose the genus *Ilex* and thousands of varieties have been named and described by botanists and horticulturists of many nationalities. Hollies abound on every continent but Australia. For the benefit of the neophyte approaching the "Holly Kingdom" for the first time, it may be helpful to describe a species of holly as a kind that will reproduce itself from seed with reasonable fidelity.

Species names are always in Latin. Thus *Ilex aquifolium,* commonly referred to as English holly, when translated literally means that it is a holly whose leaves are armed with needles. The name *Ilex cornuta,* or horned holly, aptly describes the prominently projecting lateral leaf spines that appear on either side of a depressed tip spine, normal and conspicuous characteristics of this popular species from China. *Ilex monticola*, a deciduous native holly is commonly called mountain holly; the second half of its name means "inhabiting mountains." The name *Ilex integra* refers to the "entire" (lacking teeth or lateral spines) leaf of this soft and lovely Japanese species. *Ilex opaca,* the best-known of the twenty or more North American species, is generally lacking in the leaf luster or gloss so much admired in the English hollies. Horticultural varieties of hollies are groups within a species. They arise through variations among seedlings and those obtained by propagation of mutants or bud sports. When the new characteristics appear to be worthy of perpetuation, and are propagated vegetatively, a clone is produced and may be given a descriptive name or epithet, added to that of the species. Thus *Ilex aquifolium* 'Rederly' is the name of an unusually beautiful and early-ripening English holly that I introduced to the nursery trade in 1935.



Silver Weeping Holly, *Ilex aquifolium argentea marginata pendula.*

Other forms of hollies are derived from both the natural (putative) or artificial (planned) hybridization of *Ilex* species. Here lies a fertile field for skilled plant breeders, and I predict the appearance of new and exciting interspecific hybrid hollies within the coming decade. Several putative or apparently accidental natural hybrids are already in the trade. Many planned crosses are cropping up every year, and the new hybrids are generally distinguished by exceptional vigor of growth and resistance to extreme heat and cold. It is not unlikely that hollies will be produced in the near future that can be safely planted with a minimum of care and protection, to provide beauty and joy in areas where hollies are virtually unknown because of adverse growing conditions for the less winter-hardy types.

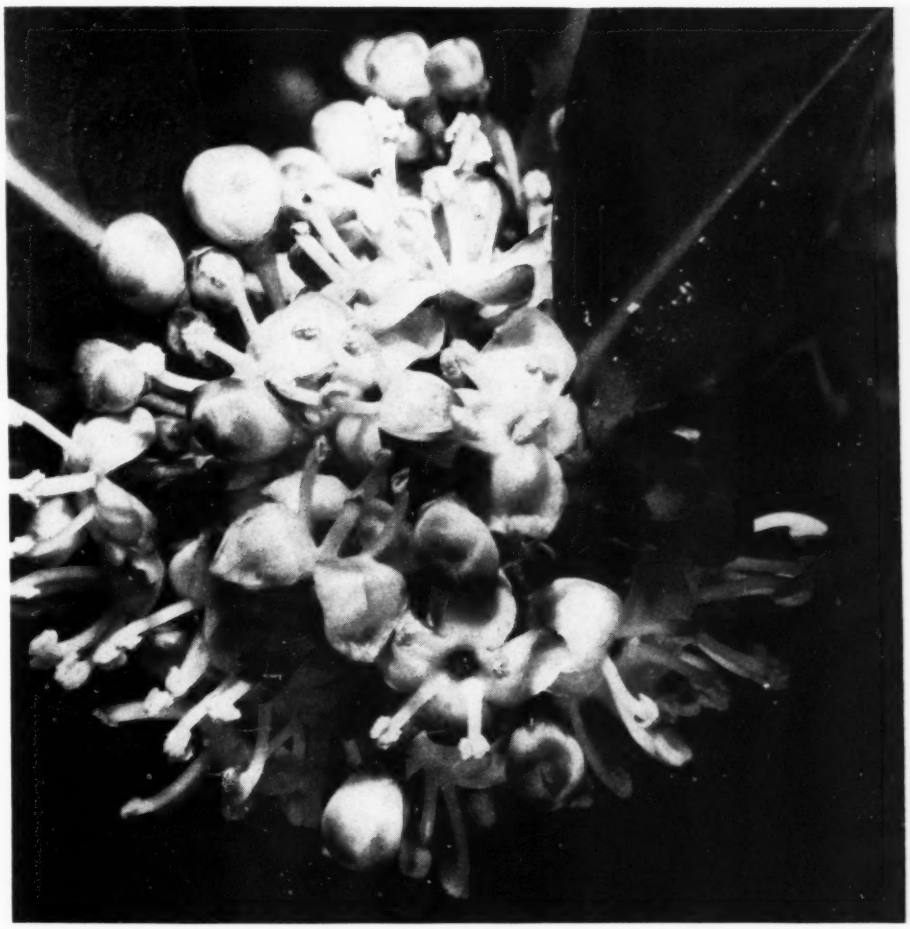
As one examines closely the evergreen hollies, he will be amazed at the diversity in shape, size, and substance of leaf, even in the varying shades of green, and in the waxy surfaces ranging from a lustrous gloss to a dull flat finish. Other variable characteristics include

color of berries and their shape, size, firmness, and placement along the branch; color of twig bark; and general growth habits, such as fastigiate or columnar, pendulous or weeping, arborescent or shrubby, or even naturally dwarfed. Assaying these many points of difference results in certain criteria for the evaluation of any single holly. We who know our hollies by living among them have assumed the challenging role of judge as we pursue our quest for the most beautiful, interesting, or useful hollies to be selected for naming and perpetuation.

These named clones, which are extensions of a single specimen holly on independent root systems, possess great value to the grower, who is thus enabled to share his prized hollies with all who come to admire them. Fortunately the hollies respond readily to asexual or vegetative reproduction. Various methods are employed according to the material available: layering, budding, grafting, and the rooting of cuttings. Sources of clones are seedling hollies from either natural or controlled breeding, and bud sports. It is an exciting, rewarding experience to discover a "beauty queen" among thousands of sister seedlings, or a spontaneous mutant twig, one of nature's unheralded whims, appearing seemingly out of nowhere to display leaves of green transformed to silver and gold.

Each seedling holly when mature will prove to be either male (staminate) or female (pistillate), for hollies are dioecious; the two sexes are formed on separate plants. The reproductive function of the male hollies is to furnish the pollen necessary for the fertilization of the ovules borne in the pistillate flowers of the female hollies. The male hollies are incapable of fruiting. The "berries" are really drupes and conceal within their pulpy interior generally four nutlets, each containing a seed. The proximity of a male, either as a separate tree or as a branch budded or grafted upon a female tree, is essential for the production of fertile seeds. As a temporary expediency, a bouquet of flowering male branches kept fresh in a can of water can be hung from the limbs of an unattended female holly. Bees and other insects seeking honey from the nectaries of the holly flowers are invaluable if unwitting agents in

(Continued on page 233)



The male flowers of the English holly, *Illex aquifolium*, greatly magnified.

The female flowers of the English holly, *Ilex aquifolium*, greatly magnified

A NEW INTEREST IN BIGENERIC HYBRIDS

By **Paul Arnold**

Mr. Arnold is a grower and hybridizer of gesneriads at Binghamton, New York, and is the International Registrar for the *Gesneriaceae,* excluding *Saintpaulia.*

HOUSE-PLANT GROWERS in the United States, understandably enthusiastic about modern developments in the large size and remarkable colors of florists' gloxinias, are also showing an upsurge of interest in the hybrid genus × *Gloxinera.* Amateur hybridizers, rather than professional plant breeders, have produced in the last few years an astonishing number of new gloxinera forms. These new hybrids exhibit a considerable range of color and pattern resulting from crosses of sinningias with rechsteinerias, some of which had not previously been reported as parents of gloxineras. The appearance of several F_2 hybrid gloxineras has demonstrated the fertility of many of these bigeneric crosses.

The hybrid genus × *Gloxinera* was established in 1895 by John Weathers (*Gardeners' Chronicle* Ser. 3. **17**:144) who combined two now obsolete generic synonyms to produce the name. For the sake of euphony, we can be glad that Mr. Weathers could merge the two names, *Gloxinia* and *Gesnera,* and was not required to devise a name, under the International Code, which would combine the names now current for the genera, *Sinningia* and *Rechsteineria.*

Fig. 1. *Gloxinera 'Brilliant'*, reproduced from the *Gardeners' Chronicle,* 1895.

The plant celebrated by John Weathers in 1895 was *Gloxinera* 'Brilliant', raised in Chelsea, England, at the establishment of James Veitch and Sons. To produce the plant, a florists' gloxinia named 'Radiance' was fertilized by Veitch's foreman West with pollen from *Rechsteineria (Gesnera)* 'Pyramidalis'.

The 1900 Supplement to Nicholson's *Dictionary of Gardening* describes the plant: "The flowers are of the usual size of the Gloxinia, horizontal in position, and of a rich carmine-crimson colour. The foliage is intermediate between the parents, and decidedly ornamental." The life-size picture with which Weathers illustrated his description in the *Gardeners' Chronicle* (Fig. 1) shows a "slipper-type" florists' gloxinia with typical leaves and flowers. The fact that *Gloxinera* 'Brilliant' does not resemble both parents has led to recent speculation that it may not have been a genetic cross but merely a product of apomixis. The modern gloxineras, on the other hand, like the first gloxinera of record (× *Gloxinera gesnerioides* of 1846) have forms intermediate between their parents (Fig. 2), and the resemblance to both parents persists in F_2 hybrids which have recently appeared as the result of breeding some of the new gloxineras back to one of their progenitors.

Dr. Harold E. Moore, Jr., of the Liberty Hyde Bailey Hortorium at Cornell University, summarized in 1954 (*Gentes Herbarum,* 8: 397) the gloxineras that had been recorded in the botanical literature up to that time, but under different names. He made two new combinations that had been overlooked by John Weathers in 1895, namely:

× *Gloxinera donkelaariana* (Lemaire) H. E. Moore, raised by Donkelaar, Jr., Head Gardener at

Fig. 2 *Gloxinera* 'Longiflora' (center) with the pollen parent, *Sinningia eumorpha,* on the left, and the seed parent, *Rechsteineria cardinalis,* on the right, was produced in 1955 by Cornelius Ackerson in Keyport, New Jersey. It has been back-crossed successfully with *R. cardinalis,* but not with *S. eumorpha.*

Fig. 3. The Classic *Gloxinera* 'Bernice' has the same parentage as the Reciprocal *Gloxinera* 'Longiflora'. The characteristics of the seed parent predominate in each case. Flowers of 'Bernice' resemble those of slipper-type sinningias more than they do flowers of *Rechsteineria cardinalis*.

the University Botanical Garden, Ghent, Belgium, in 1849, from *Rechsteineria discolor* ♀ × *Sinningia speciosa* 'Rubra' ♂.

× *Gloxinera gesnerioides* (Lemaire) H. E. Moore, pictured in *Flore des Serres* (February 1846) without indication of its origin but described as a product of *Rechsteineria cooperi* ♀ × *Sinningia tubiflora* ♂.

In this same paper, Dr. Moore ushered in the modern wave of breeding activity that has led to the production of many new gloxinera forms. He described an interesting intergeneric hybrid produced at Fantastic Gardens in South Miami, Florida, in 1954 by Robert G. Wilson. This contemporary hybrid was designated × *Gloxinera rosea* H. E. Moore and R. G. Wilson. The seed parent was *Sinningia eumorpha*, fertilized by pollen from *Rechsteineria (macropoda) cyclophylla*. The use of *S. eumorpha* as a progenitor for gloxineras opened up a whole new world of plant breeding.

Fig. 5. A 'Harold Hybrid' gloxinera produced by fertilizing the original seed parent, *Sinningia eumorpha* with pollen from *Gloxinera* 'Harold'. The latter had *Rechsteineria* 'Splendens' as the pollen parent. This unnamed seedling has white flowers illuminated by long scarlet hairs, particularly near the base of the tube.

Contemporary Gloxinera Clones

The cross that Wilson made in Florida was repeated at Cornell University in Ithaca, New York, and elsewhere. A seedling of × *Gloxinera rosea* was selected for clonal reproduction and named *Gloxinera* 'Rosebells' by Mrs. Peggie Schulz of Minneapolis, Minnesota. That cultivar name was published, with a brief description, in *The Gloxinian* (May-June 1955), and clonal propagations of the plant were offered for sale by the seedsmen Geo. W. Park of Greenwood, South Carolina, in their 1956 catalog.

The publicity given in 1955 to the appearance of *Gloxinera* 'Rosebells' inspired a great deal of activity among house-plant breeders. Many different gloxinera cultivars have been produced, described, and named in the ensuing five years. Three of them, 'Coral Gem', 'Harold', and 'Bernice' (Fig. 2), have been registered with the International Registration Authority.

Apart from the basic fascination which the whole subject of intergeneric hybrids naturally has for plant breeders, the fact that these "mules" in the gesneriad family are usually fertile has been a stimulant to the creation of many different gloxineras. Additional factors that contribute to this activity in amateur plant breeding are:

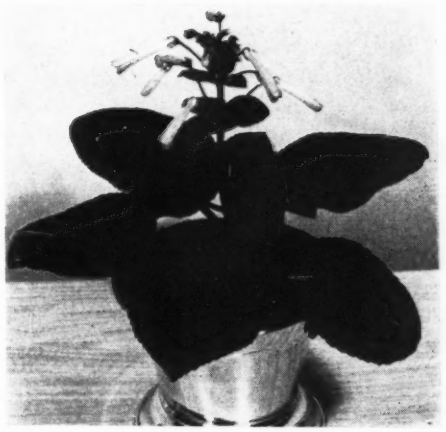


Fig. 4. A 1958 Reciprocal cross made by Peggie Schulz of Minnesota. *Sinningia eumorpha* was the pollen donor, but the plant closely resembles the seed parent, *Rechsteineria* 'Purpurea'. In Classic crosses between the same two parents, Mrs. Schulz has produced dwarf plants with small leaves and two-inch long flowers of imperial purple.

1. The Ease of Propagation. Both sinningias and rechsteinerias produce flowers with sexual parts which are easily accessible and of conveniently large size. The flowers of both parents can be brought into bloom, by proper management, at the same time and during any chosen month of the year. With only nine months or a shorter period between seeding and flowering, the results of a cross become available without an intolerable wait. In addition, neither *Sinningia* nor *Rechsteineria* flowers are normally self-pollinated, and emasculation is quite easy to accomplish.

2. A Great Variety of Form and Color. Both sinningias and rechsteinerias occur in a wide spectrum of flower colors, from brilliant saturated hues to the softest pastel tints. The size and forms of the flowers extend over a wide range in both genera. The habits of the plants and their leaf and stem characteristics offer further opportunities to the plant breeder in developing new forms.

Three Classes of Gloxineras

For convenience in discussing the several types of gloxinera crosses which are popularly grown today, they have been classified in three groups: (1) the Classic Group, characterized by the original *Gloxinera* 'Brilliant', in which a *Sinningia* is the seed parent, fertilized by pollen from a *Rechsteineria.* (2) the Reciprocal Group, in which a *Rechsteineria* is the seed parent, and the pollen comes from a *Sinningia:* the registered *Gloxinera* 'Coral Gem' is an example of the Reciprocal Group. (3) the Complex Group, including F_2 gloxineras in which both Classic and Reciprocal crosses have been backcrossed with one of the parents, along with selfed gloxineras and other possible combinations.

The Classic gloxineras are listed in Table I. All the clones that have *Sinningia eumorpha* as the seed parent are currently grown in the United States, and most of them are commercially available. Apparently none of the contemporary plant breeders has succeeded in reproducing the *Gloxinera* "Brilliant' cross, which would call for the use of *Sinningia speciosa,* or else one of the florists' gloxinias of complex ancestry, for the seed parent. On the contrary, several experimenters have indicated in conversation and correspondence that they have consistently failed, despite repeated attempts, to produce gloxineras by using florists' gloxinias or any other sort of *Sinningia* except *S. eumorpha.*

The list of Classic gloxineras includes four cultivars which have the same general parentage. Although the breeding was done at three different places, *Sinningia eumorpha* was the seed parent in each cross, and some form of *Rechsteineria cardinalis* served as the pollen donor. Both gloxineras 'Harold' and 'Velvet Charm' were selections from the seedling population of a single cross made in Ithaca, New York, using *Rechsteineria cardinalis* 'Splendens' as the pollen parent. Two other *R. cardinalis* clones of unknown distinction have been used as pollen parents for *Gloxinera* 'David' and *G.* 'Bernice'. The latter was raised in California but not at Sebastopol, which was the home of *Gloxinera* 'David'. The four gloxineras are distinct in appearance despite their similarity of parentage. For example, *Gloxinera* 'David' is a larger, more robust plant than *G.* 'Bernice', and the flowers have markings in the throat which resemble those of *R. cardinalis,* while the flowers of 'Bernice' are marked inside like the flowers of *Sinningia eumorpha.*

Some Reciprocal crosses which have been successful in producing gloxineras are shown in Table II. Only one of these, 'Coral Gem', is in the trade. The plant was raised in 1957 by Mrs. Catherine B. Shepherd of Arlington, Virginia, from a cross made the previous year. The cultivar name was selected and registered in 1958, and the plant was first offered for sale by the House of Plants in 1960. An unnamed Reciprocal gloxinera of unusual parentage is shown here (Fig. 4). Donkelaar's 1849 hybrid long ago disappeared from cultivation, and no record has been found that the cross has been successfully repeated in recent years.

Some New Complex Gloxineras

The only exception to the current record of frustration in using sinningias or florists' gloxinias as parents for gloxineras comes from Bruce A. Thompson of Philadelphia, the President of the American Gloxinia Society. Using *Sinningia regina* hybrids in his breeding program, Mr. Thompson has produced a number of Complex gloxi-

Table I
CLASSIC GLOXINERAS WITH SINNINGIA AS THE SEED PARENT

Seed Parent	Pollen Parent	Grower	Cultivar Name	Date
S. tubiflora	*R. cooperi*	unknown	'Gesnerioides'[1]	1846
S. speciosa	*G. donkelaariana*	unknown	'Gesneroides'[2]	1884
S. speciosa	*R. pyramidalis*	James Veitch	'Brilliant'	1895
S. eumorpha	*R. cyclophylla*	Peggie Schulz	'Rosebells'[3]	1955
S. eumorpha	*R.* 'Splendens'	Peggie Schulz	'Velvet Charm'	1956
S. eumorpha	*R. cardinalis*	Reynolds Gardens	'David'	1957
S. eumorpha	*R.* 'Splendens'	House of Plants	'Harold'	1958
S. eumorpha	*R. cardinalis*	Don Horton	'Bernice'	1958
S. eumorpha	*R. warszewiczii*	Rodda Gardens	unnamed (seed)	1959
S. eumorpha	*R.* 'Purpurea'	Peggie Schulz	unnamed	1959

1. The name × *Gloxinera gesnerioides* (Lemaire) H. E. Moore was a combination made in 1954 by transfer of Charles Lemaire's *Gloxinia* × *gesnerioides* of 1846 to the hybrid genus × Gloxinera of Weathers.

2. The *Gloxinia gesneroides* that appeared in Nicholson's *Dictionary of Gardening* (1885) differed in more ways than spelling from *Gloxinia* × *gesnerioides* of Lemaire in *Flore des Serres* (1846). The latter had *Sinningia tubiflora* and *Rechsteineria cooperi* as parents. Dr. Moore has accepted an 1884 report from Germany that the plant pictured by Nicholson was an F_2 hybrid gloxinera resulting from *Gloxinera donkelaariana* backcrossed with *Sinningia speciosa.* Other writers have stated that the *Gesnera donkelaarii* Hooker, which went into the cross, was not Donkelaar's gloxinera of 1849 but a native rechsteineria which was imported from Colombia by James Veitch and Sons, first flowered in 1858, was accepted by Sir W. Hooker as a species (*Botanical Magazine* t. 5070, 1858), and named because of its resemblance to the plant already known as *Gesnera donkelaarii.* Those who incline to the latter view would accept the *Gloxinia gesneroides* of Nicholson as an F_1 *Gloxinera.*

3. The first example of × *Gloxinera rosea* H. E. Moore and R. G. Wilson was produced by Robert G. Wilson in 1954. Some plants of two different clones were retained for propagation at Fantastic Gardens in Florida and subsequently distributed without cultivar names. A more recent cultivar claimed to have this same ancestry was *Gloxinera* 'Nancy Kaye', first mentioned in *The Gloxinian* (Sept.-Oct. 1958).

Table II
RECIPROCAL GLOXINERAS WITH RECHSTEINERIA SPECIES AS THE SEED PARENT

Seed Parent	Pollen Parent	Grower	Cultivar Name	Date
R. discolor	*S. speciosa* 'Rubra'	Donkelaar	'Donkelaariana'[1]	1850
R. cardinalis	*S. eumorpha*	Ackerson	'Longiflora'	1955
R. cyclophylla	*S. eumorpha*	Shepherd	'Coral Gem'	1956
R. 'Purpurea'	*S. eumorpha*	Schultz	unnamed	1959
R. leucotricha	*S. eumorpha*	Ackerson	unnamed	1960

1. The transfer to × *Gloxinera* from Charles Lemaire's name *Gesnera donkelaariana* was made by H. E. Moore in 1954.

neras (Fig. 5). Some of the Thompson named cultivars are included in Table III. Mr. Thompson used as pollen parent a *Sinningia regina* seedling which has reddish flowers. This plant had resulted from crossing *S. regina* with a red-flowering hybrid slipper-type sinningia and back-crossing the progeny (for two successive generations) with *S. regina.* Although the pollen parent of *Gloxinera* 'Clarice T' and its sister plants contains only a fraction of red-flowering ancestry, along with a preponderance of purple-flowering *Sinningia regina* parentage, the red color has persisted in the third generation of this interspecific hybrid sinningia. The effect of the dominant red coloring is strikingly evident in the gloxinera generation and adds greatly to the appearance of the flowers.

Recreation of Old Hybrids

Another Classic gloxinera, first reported in 1846, had been repeated in 1957 but, through misfortune, was again lost to cultivation. Viable seed was obtained from this Classic cross in which *Sinningia tubiflora* was used as the seed parent and fertilized by pollen from *Rechsteineria cardinalis.* The Reciprocal cross, with the same progenitors, resulted in a swollen ovary, but none of the matured seed appeared to contain any germ, and no plants resulted. Four plants of *Gloxinera gesnerioides* from the Classic cross were raised to flower bud stage in 1958, but all were lost through inattention while I was overseas during that June.

The geneticist Dr. Sheldon C. Reed of St. Paul, Minnesota, writing in *The Gloxinian* (Jan.-Feb. 1960) has observed that when gloxinera hybrids between *Sinningia eumorpha* and *Rechsteineria cyclophylla* are back-crossed with *S. eumorpha,* the resulting F_2 progeny very often have white flowers covered with "an interesting 'velvet' of red hairs" on the outer surface. The occurrence of scarlet hairs on white flowers is generally characteristic of the progeny that result when *Gloxinera* 'Harold' is back-crossed with *S. eumorpha,* though the red hairs (in this case an inheritance from *R. cardinalis*) are of too great a length and too widely spaced for most people to characterize them as a "velvet." Figure 5 shows a typical 'Harold Hybrid' gloxinera having red hairs on a white tube.

Not all the 'Harold Hybrid' gloxineras have red hairs on white flowers, however. Sister plants to the one shown in Figure 5, raised from the same seed capsule, have shown white hairs on a white tube. Occasionally the tube itself is stained a faint pink color (with white hairs), and one plant had flowers with white hairs on a tube which was uniformly tinted pale bluish violet. In addition, the forms of the flowers differ considerably among the progeny of *Gloxinera* 'Harold' back-crossed with *Sinningia eumorpha.* It is the observance of such differences that provides the amateur breeder of gloxineras with some of the fascination that he feels in this pursuit.

Dr. Reed has pointed out, in the same article, that *Sinningia eumorpha* has an affinity for various *Rechsteineria* species which is not shared with other sinningias. He reports repeated failure in trying to cross *S. eumorpha* with other sinningias. Dr. Reed's experiences provide a genetic clue which should aid other investigators in answering some of the many questions that have been raised all during the past century, and even longer, about the taxonomy of the various plants within the presently accepted boundaries of *Sinningia.*

In the century from 1846 to 1947, only four examples of the hybrid genus × *Gloxinera* have been described in the literature. Including the items that are mentioned here for the first time, some twenty-six different gloxineras have been reported since 1954. This recent enthusiasm for crossing sinningias with rechsteinerias and with the resulting gloxineras exists for the most part among amateur horticulturists. These experimenters are serious workers and, despite their lack of professional training, keep at least minimal records of their crosses; many of them work with great care and precision. Some of them are conscientious about registering their introductions, and a few are proficient in writing accounts of their achievements for gardening publications which are always happy to publish stories about new plants. Consequently, there is building up a body of miscellaneous information about the performance of various species in the breeding of these interesting bigeneric hybrids, which may be of use to future researchers in genetics and taxonomy. To that increasing store of information, this contribution is hopefully added.

Table III

COMPLEX GLOXINERAS HAVING A GLOXINERA AS ONE PARENT

Seed Parent	Pollen Parent	Grower	Cultivar Name	Date
Sinningia eumorpha	*Gloxinera* 'Velvet Charm'	Rodda Gardens	unnamed (seed)	1959
Sinningia eumorpha	*Gloxinera* 'Velvet Charm'	Yoars Nursery	unnamed (seed)	1960
Sinningia eumorpha	*Gloxinera* 'Rosebells'	S. C. Reed[1]	unnamed	1960
Sinningia eumorpha	*Gloxinera* 'Harold'	House of Plants	'Harold Hybrids'	1958
Gloxinera 'Rosebells'	selfed	Peggie Schulz	'Pink Parfait'	1957
Gloxinera 'Velvet Charm'	*Rechsteineria* 'Splendens'	Peggie Schulz	unnamed	1960
Gloxinera 'Velvet Charm'	*Rechsteinaria warszewiczii*	Rodda Gardens	unnamed (seed)	1959
Gloxinera 'Longiflora'	*Rechsteineria cardinalis*	Ackerson	unnamed	1958
Gloxinera 'Longiflora'	*Rechsteineria leucotricha*	E. J. Farwell	unnamed	1958
Gloxinera 'Harold'	*Sinningia eumorpha*	House of Plants	'Harold Hybrids'	1958
Gloxinera 'Rosebells'	*Sinningia regina*	B. A. Thompson	'Edith M'	1959
Gloxinera 'Rosebells'	*Sinningia regina*	B. A. Thompson	'Clarice T'	1960
Gloxinera 'Rosebells'	*Sinningia regina*	B. A. Thompson	'Rita L'	1960
Gloxinera 'Rosebells'	*Sinningia eumorpha*	Peggie Schulz	'Bonbon'	1957
Gloxinera 'Rosebells'	*Sinningia eumorpha*	Peggie Schulz	'White Dove'	1957

1. Reported in *The Gloxinian* (Jan.-Feb. 1960), grower not stated.

A JUNE DAY ON MT. WASHINGTON

By **Doris G. Schleisner**

Mrs. Schleisner is daughter of Samuel H. Gottscho and wife of William Schleisner of the widely known photographic firm of Gottscho-Schleisner. She has accompanied them on many of their trips to photgraph plants and gardens and has written on native plants for magazines and newspapers.

AMONG THE thousands of ski enthusiasts whose destination at least once this winter will be Mt. Washington, monarch of the great Presidential Range of New Hampshire's White Mountains, some will make a return trip in June. Their interests run to things botanical. Stout hiking shoes will replace ski boots, for June is a month when nature lovers explore on foot the upper slopes of Mt. Washington and the adjacent peaks. Here, above timberline, they will find in bloom the earliest-flowering and some of the loveliest of the rare alpine plants (others bloom during July and August) that make of these higher summits small islands of arctic flora in the temperate zone.

The story of this unique flora which is composed of about forty-five species dates back to the Ice Age. As the great sheet moved down from the north, it carried with it many arctic plants which were distributed through New England. With the retreat of the glacier, most of the plants likewise retreated to their arctic homes. Above timberline on the highest Presidential Range peaks, where temperature and climatic conditions match those prevailing on the Atlantic Coast of northern Labrador, these alpine plants were able to survive. Those that bloom this coming year are lineal descendants of parent plants that bloomed thousands of summers ago.

These dainty blossoms are for the most part delicately hued and minute in stature, seemingly so fragile, yet able to withstand severe cold, strong winds, and deep snow. Far different from the brilliant flowers that paint the alpine meadows of the High Sierra and the Alps, they possess an elusive charm all their own which has lured many botanists and nature lovers to the craggy heights where they grow.

Whether on foot, or by rail on the famous Cog Railway, or by car on the equally famous Summit Road, the ascent of Mt. Washington to the alpine zone and the summit is an unforgettable experience. The climb, which is breath-taking as the "epic landscape" comes into view, has a particular fascination for everyone interested in the natural sciences. Telescoping time, distance, and climate (one hundred feet up a mountain equals ten miles north, three hundred feet up a mountain brings a drop of one degree Fahrenheit), it takes the visitor on a botanical trip some six hundred miles to the north.

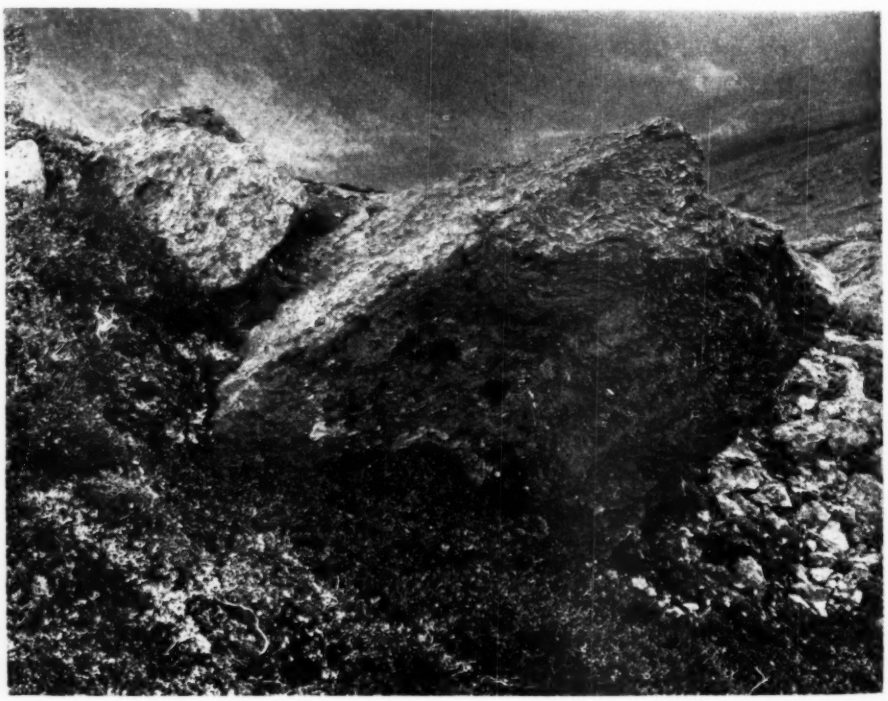
The ascent by car on the Summit Road begins among green, daisy-dotted fields; then quickly passes into a dense forest of tall fir and spruce. Along the edge of the road for car passengers to enjoy are some of the June blossoms of the evergreen north woods—twinflower *(Linnaea borealis)*, clintonia *(Clintonia borealis)*, bunchberry *(Cornus canadensis)*, partridge berry *(Mitchella repens)*, and wintergreen (*Gaultheria procumbens*). Gradually, as the road makes its circuitous climb, the forest thins out, and the trees become smaller and smaller.

At about four thousand feet trees are scarcely recognizable as such—spruce and balsam and birch appear more like shrubs than trees. Growing horizontally to conserve warmth and moisture, their branches spread out for many feet, covering rocks and boulders and forming thick, interwoven mats. Finally, at forty-eight hundred feet, even these dwarf trees disappear. Timberline has been reached, and the zone of alpine plants begins.

Not from a car window but on foot and cautiously must this fascinating terrain be explored. It is a strange land of unreal contrasts—Lilliputian growth in a Gargantuan setting. Willows, birch, and spruce measure three inches high, yet may be seventy-five years old; for here, where the wildest tempests rage, plant survival depends upon exposing as little surface to the wind as possible.

Those who come to this unique realm for the first time have difficulty, to be sure, in keeping their eyes on the ground, for there is grandeur to be seen by looking straight ahead. On a cloudless June day the air is cool, the sun hot, and the sky of deepest blue. Only the droning of flies and the plaintive notes of a white-throated sparrow break the profound stillness of these solitary heights.

In such a setting even the common-



Diapensia, alpine-azalea, and Labrador-tea near the summit of Mt. Washington.

est roadside weed could achieve distinction, let alone the rare and dainty alpines. Glowing softly against the stark granite boulders are the tiny crimson bells of the alpine-azalea *(Loiseleuria procumbens)*. A member of the Heath Family, this dwarf, almost prostrate evergreen shrub weaves its short branches into dense tangles which spread over the rocks and cover the ground.

Nearby larger deep pink blossoms stand erectly about six inches above the ground; these belong to another heath, the pale bog-laurel (*Kalmia polifolia)*. Though this is found in Greenland, this pretty laurel is not strictly an alpine, for it grows as far south as New Jersey, where it may reach a height of twenty-two inches.

Labrador-tea *(Ledum groenlandicum)* grows above timberline wherever it can find some shelter from the violent winds. Even when the clusters of small white flowers are not in bloom, this low evergreen shrub is easily recognized by the brownish, hairy under surface of the leaves. A true alpine, and said to be the flowering plant that approaches nearest to the North Pole, Labrador tea is also at home as far south as New Jersey.

Just because they are not alpines is no reason to ignore bunchberry and Canada mayflower *(Maianthemum canadense)*. Here on the heights they are tiny replicas of their lowland relatives, but none the less charming as they colonize on the soft carpet of lycopodium, sphagnum, and reindeer moss that covers the ground.

The road winds higher up to fifty-nine hundred feet, not yet the summit but deep within the alpine zone. Here diapensia *(Diapensia lapponica)* is still in bloom in June among the tiny alpine sedges and mosses that grow over the rocks. This is one of the earliest alpine plants to flower, blooming in the wake of melting snow; the dainty white blossoms are seen in June only on the chilly heights close to the summit. Even when bloom has passed, diapensia is recognizable by the dense little ground mats of tiny leaves and inch-high yellow seed pods.

One of the botanical highlights of a June day atop Mt. Washington is finding the lovely Lapland rose bay *(Rhododendron lapponicum)* in bloom. One of the less common alpines, this diminutive of the great rose bay often grows in almost inaccessible crevices of rocky ravines which only the most experienced mountaineer dares to approach. There the little two-inch plant opens its light purple flowers.

The road twists upward to the summit—6,288 feet above the green, daisy-dotted fields where it began. Here are no green fields—only grim, bleak piles of rocks where, it would seem, nothing but lichens could grow. Yet even in this wasteland nature proves its tenacity. Blooming wherever there is a bit of pulverized rock are the little snow-white flowers of the mountain sandwort *(Arenaria groenlandica)*.

HOLLY (from page 227)

accomplishing the transfer of pollen from male flowers to female flowers.

Considerable confusion exists over the importance of male hollies to assure fruiting, for female hollies can bear infertile (parthenocarpic) berries to varying degrees. Some species, such as *Ilex cornuta,* are capable of producing heavy clusters of these barren fruits with blank and hollow nutlets (pyrenes). On the other hand, *Ilex opaca* is quite reluctant to form any fruits unless the seeds within are fertile. English hollies differ widely in this respect. For example, the silver-variegated aquifoliums rigidly require fertilization before producing any berries, but some green-leaved female varieties are prone to fruit fairly freely without fertilization. No commonly known holly, however, is self-fertilizing, monoecious, hermaphrodite, or bisexual, regardless of repeated claims to the contrary. The proper descriptive term for a holly that bears infertile seeds is "self-fruiting" rather than "self-fertilizing."

Let us now assume that you have selected for adoption a "Princess Ilex" and her "Prince Consort" to assure their fruiting and perpetuation, and that you want to know about choosing just the spot for them to appear at their best. In southern states, "Princess Ilex" will need some protection against the burning afternoon sun; in the more temperate climate zones, full exposure is prescribed; in the northern states, extra protection must be provided against the frigid blasts of winter. In the sheltering lee of your home, and preferably with a northern exposure to avoid the damaging effect of frequent thawing, the hollies should flourish.

When to plant is both a good and a common question. With all-weather pot-grown hollies planted and growing upon delivery, it is quite a temptation to encourage one to plant holly any month in the year. The best time for planting, however, is when the roots are active and growing, generally from February to October. During these months, the roots will strike out vigorously and securely anchor the trees in their new environment. Except perhaps in the more southerly states, hollies become semi-dormant throughout the late fall and winter months, and they are transplanted then with the hazard of becoming winter casualties. Deep mulching, wrapping with straw and burlap, overlaying with leaves and boughs, encasing with ventilated plastic covers, and spraying with plastic coatings to restrict transpiration are among the true gardener's "bag of tricks" to bring his hollies unharmed through the worst that cruel winter sometimes serves.

Other do's and don'ts that can never be repeated too often are to be liberal with water as you plant hollies and generous, too, with soil to fill in about their sturdy roots. For *Ilex* is a vigorous grower and will respond to your every thoughtful ministration. Plant *Ilex* high above ground level to compensate for future settling, as the soil around and beneath becomes compacted by successive waterings. Sunken hollies will suffer from root rot and lack of soil aeration. Remember, too, that *Ilex* simply will not tolerate wet feet. As you complete the planting, cup, but never dome, the soil about a holly; remember that a cup holds water, a dome sheds water. Then remember to water again and again until roots and soil are firmly cemented together, and earth's capillary action restored.

Here are a few tips to help you learn the language of the hollies. They are surface feeders, whose roots fill the top soil beneath the spread of protecting limbs. Be sure to provide a cover or mulch to prevent the surface roots from drying, burning, or freezing. As they mature, they will mulch their own roots with the worn and older leaves that they shed, so never spade about your hollies nor cultivate too deeply. If the trees are tall, or exposed to winds,

stake them securely until they become well anchored, after which they will withstand gales of hurricane force. Feed sparingly at first, later more, but always a balanced ration. When hollies lack minerals, their leaves lose luster, and if they are long neglected they will become pale. Avoid fall feeding, for late growth renders hollies soft and susceptible to winter cold.

Whatever your fancy dictates or whatever problems your landscaping poses, there is just the right holly for you. The English hollies, preferred for their wavy leaves of glossy green and their heavy clusters of sparkling red berries at the Christmas season, are today being widely planted throughout the United States. Pot-grown named varieties from proven winter-hardy stock are receiving wide acceptance in areas once thought to be inhospitable to English holly.

A Country Housewife's Garden

By

Gertrude B. Foster

IT STARTED with a "baby-blessing" bouquet I made up for my niece's new baby. My niece now wants to grow the herbs that smelled so good in the little nosegay, in a garden of herbs at her new home in Saudi Arabia. Some of the pungent plants chosen for the old-fashioned bouquet, because of their legendary meaning, would be quite at home in that part of the world. Rosemary, for example, grows wild in the Jordan Valley; but others, such as mugwort, might not do so well in a hot climate. Mugwort had been included in the bouquet with a special meaning to wish the new born son good traveling. "A leaf of mugwort in the shoe means that you can walk forty miles before noon without tiring," says the legend. Rosemary for a good memory, balm for good cheer, sage for long life, chamomile for a strong stomach, borage for courage, strawberry for perfection, and love-in-a-mist or devil-in-the-bush for mischief—these were the ingredients of the "baby-blessing" bouquet.

Amid larger floral tributes to the mother and child the herbs attracted great attention from visitors and nurses. The young mother had to explain the meaning of each one over and over. The fragrant leaves and few flowers were surrounded by a lace-paper doily and tied with a dainty bow. I was delighted to learn that my small offering was carried home from the hospital so that each sprig might be pressed and put away with the congratulatory cards. Evidently the message to be found in a little "tussie mussie" meant just as much to a modern matron as it did in olden days when the language of flowers was the subject of books. *Flora's Lexicon* is the title of one such gem. I was surprised to find mentioned in this nineteenth century volume our native cardinal-flower "for distinction." I might have added a few leaves of grape "for mirth" as background for the nosegay of herbs, if I had not used the paper filigree.

Packets of herb seeds will make an interesting Christmas gift to be taken back to the desert land where no religious services can mark the Christian holy day. I have given quite a bit of thought about what to select for this beginner's garden to be planted in Jeddah, thirty miles from the Moslem holy city of Mecca. Once I sent basil seeds to be planted in a salad garden. They sprouted in two days and grew so rapidly that the seedlings had to be weeded out very quickly. At least that was the Arab gardener's murmured excuse for their disappearance. It seems that some species of the herb grew wild in the compound, where anything would grow in the sandy soil if it were given enough water. My niece was not well enough acquainted with herbs to know whether the basil I sent her and the plant that stood four feet tall in untended corners of the walled yard were the same. The latter may have been a less fragrant variety—like the surprising *Ocimum carnosum* I grew this year that had no characteristic clove-like scent at all.

I want to include herbs which will remind the transplanted family of a New England herb garden; and on checking over those in the hospital bouquet, I was brought up short by the realization that sage, thyme, and chamomile will be going back to the scene of their origin. How tenderly these plants have been carried from civilization to civilization: by the Crusaders to England, by the Pilgrims to the New World; and now they will be journeying back again, not as outlandish plants but as heart-warming reminders of home. As a minority group in a non-Christian country, the American family celebrating Christmas in its home is rather like the early dissenters in the Puritan Colony of Massachusetts. The celebration of Christmas was forbidden by law in 1659 as a "festival superstitiously kept." Only the Church of England members are reported to have defied the law that ordered work as usual and forebearance of feasting or the like for twenty-two years. It was not until the nineteenth century that Christmas became a legal holiday in the United States.

Gardening in Arabia is limited to the water supply available, so I have planned the seed gift to furnish the most fragrance and flavor from the least amount of space. All the herbs must be sent or taken to the country as seeds. Some may be growing in fertile spots in other parts of the Middle East but for the project at hand there could be no hope of securing plants. My niece does not have even a nodding acquaintance with botany or horticulture; she must enter either field through the kitchen door.

In Saudi Arabia it would be possible to grow a mandrake to blooming size. In my garden the carrot-like roots of *Mandragora officinarum* sulk all summer with not a sign of green at the top. But who wants a magical mandrake in a kitchen garden? The young people have no need of a fertility charm. Some species of lavender are indigenous to Arabia, say the experts. It would be easy to grow the sweet-scented herb of the clothes-press there, but that can wait until the new herbalist is better acquainted with the savory culinary herbs. She will want marjoram to

transform the all too-familiar roast of lamb. *Origanum* species are found in Israel; there sweet marjoram will become an evergreen shrublet with its hop-like white flowers lasting over a long period.

Artemisias do grow around the ancient city of Bethlehem. *A. vulgaris* might be included, I judge, from reading *From Cedar to Hyssop* by Crowfoot and Baldensperger; it is a "study in the Folklore of Plants in Palestine," published in England in 1932. Species of *Anchusa,* cousin to borage, are listed in this book so a packet of borage, *Borago officinalis,* will be added. The blue star-shaped flowers will be a delight to the eye, and the tender young leaves will give a cool cucumber-like quality to salad if chopped fine. *Melissa officinalis,* or lemon-balm, is not described as native to the Middle East, but surely it would grow as well as the salvias which are quite numerous there. Perhaps I had better search for a copy of this out-of-print book to send with the seeds. If the gift seeds take root, my niece may be able to collect seeds of some of the herbs illustrated at the end of the book to send back to me. It is a lost year in the garden and greenhouse that does not see some hitherto unknown (to me) plant brought from seed to flowering.

Parsley can be grown in Saudi Arabia in the cool months so why not chervil? The lacy-leaved annual suffers from sun-burn in my garden, but under the shade of bushes or trees it might make a delicate groundcover and offer faintly tarragon-tasting leaves to chop over chicken. Summer savory also will give several cuttings in a few short months of the growing season to go with beans and chicken. Thyme would be no problem if rains did not wash out the fine seeds. It could be sown in the sandy soil and irrigated gently on either side of the row or watered with a fine spray. Water is carried in donkey carts in Saudi Arabia and thrown by bucket on the grass. One of the repeat-action sprayers with a hose to rest in a pail of water would be ideal in such a situation. The nozzle permits turning the spray to any degree of fine misting, and the brass tube that is pumped by hand will throw a stream thirty-five to forty feet. It has taken the place of the harder-to-clean tank sprayers in all operations on our place from spraying small fruit trees to watering seedlings in the greenhouse or feeding them with liquid plant food.

I may be too ambitious in imagining a garden to be grown in Saudi Arabia from a small gift of seeds. Other gardens, all planted for friends, have not proved the "open sesame" to the intriguing study of herbs that I had hoped they would. Yet this time it may be different. To raise plants from seed is as different from buying plants as bearing children is different from adopting them. The waiting seems to prepare one for the wonder of growth. The planted seed, even while in the ground, gives a sense of anticipation and excitement that the potted plant purchased or presented by another can never quite approach. Whether or not the young mother will find time to do the sowing and weeding herself, I hope she may know the pleasure that comes from handling fragrant plants. Working in the soil is a release from anxiety and loneliness unmatched by any other medium except perhaps by modeling in clay or painting. The more we are surrounded by manufactured things, or limited in movement, the more necessary such activity is in bringing peace to the spirit. I was surprised last winter to hear a young Chinese refugee student, about seventeen years old, speak of the exquisite gardens in his home village. He said with an ancient wisdom, "Women cannot go anywhere outside of the walls of their home village so they grow beautiful flowers and arrange them most artistically."

The scented leaf of sage held in a warm hand can carry one's spirit over a compound wall and across the ocean to the place where it was first encountered.

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LETTERS TO THE EDITOR

Willa Cather in her novel *Sapphire and the Slave Girl* (Book 2, Chapter 1) tells of an older man (Blake) without a family who takes a sick boy who has no family and nurses him back to health. She writes:

"Blake took me [the young boy] to his room, and he and the old Mexican women nursed me. He ought to have had boys of his own to look after. Nature's full of such substitutions, but they always seem to be sad, even in botany."

Can you tell me what substitutions in botany Miss Cather is referring to? I have found nothing that seems to fit this allusion. The closest I have come is the dodder, which plant Miss Cather would have known in Nebraska.

JOHN MARCH
Willa Cather Pioneer Memorial
New York, N. Y.

Dr. H. W. Rickett, Acting Assistant Director (Botany) and Bibliographer, in answering our correspondent said in part:

I confess that the idea of a plant nursing a young and ailing plant back to health leaves me somewhat at a loss. And plants are the only subject of botany.

A plant doesn't even care for its own offspring, except for a little food provided as a starter.

Of course there are, as you suggest, parasites: dodder, mistletoe, and the whole army of parasitic fungi. But I don't see how their relations with their hosts could be spoken of as "substitutions."

It has been suggested, by another member of the Garden's staff, that a scion—a detached shoot capable of propagation by being grafted to another plant—may constitute a substitution in botany.

I have received a copy of the July-August 1960 issue of *The Garden Journal,* with its most interesting article on the Croton Point Underhills of whom I know considerable by first-hand knowledge and from my late father who visited his relatives there when he was a young man three-quarters of a century ago. I have in my possession my father's photograph of "Interwasser." My father always lamented the fact that Croton Point went out of the Underhill family, but he was pleased that Westchester County finally acquired the property for park purposes.

I know that Charles A. Underhill will want to make favorable comment on this article in the next issue of the semi-annual *Bulletin* of the Underhill Society.

DUDLEY FIELD UNDERHILL,
Mill Neck, Long Island

Mrs. John H. Ballantine, an Underhill descendant and member of our Society, has been good enough to send me the July-August 1960 issue of *The Garden Journal,* containing Dr. Edmund H. Fulling's article on "Yew Trees and Vineyards of Croton Point."

It is interesting to note that we published an article by Stephen Maurice Underhill, son of Stephen W., in the June 1960 *Bulletin,* of which I am enclosing copy. The copy I hold of *The Garden Journal* will go into the Underhill collection of the family.

CHARLES A. UNDERHILL, *President*
Underhill Society of America,
Greenwich, Connecticut

I have met many people who saw the article on "The Quaker Hill Museum of Natural History" in the July-August issue of *The Garden Journal,* and quite a few have come to see the Museum. This brings me to the reason for this letter.

The Quaker Hill Museum of Natural History moved to larger quarters not far from its present location the middle of September. The new quarters in the Aiken Free Public Library on Quaker Hill, Pawling, New York, provide more room to display the exhibits to better advantage.

To reach the Museum's new location, follow Route 22 north; turn right about twelve miles after leaving Brewster, at the first traffic light where there is a sign "Quaker Hill"; follow the paved winding road that ends at the top of the hill; turn right and go south for about half a mile. The Aiken Free Library is a large stone building on the left, at the intersection of four roads.

OLIVE M. GUNNISON
(*Mrs. Raymond M. Gunnison*)
Pawling, New York

You should know what delight "Echoes of the Past" has given me, as I knew the Brittons in the early days at The New York Botanical Garden—spent many hours in the laboratories and studied mosses with Mrs. Britton.

Several times Miss Delia W. Marble came to see Mrs. Britton. When in the early 1930s I was able to start a little garden club here in Somers, I was greatly encouraged by Miss Marble. She introduced me to Miss Luquer and others of the Bedford ladies who had done so much in public-spirited development of that lovely old town—the making of Pound Ridge Reservation, and so on. As we struggled to make our garden club more than a social gathering, Miss Marble and Miss Luquer came quite often to talk to us, showed the collection of lovely paintings by Miss Luquer, and helped in so many ways.

I just remember the Agassiz Club as a little girl and mostly recall the huge green caterpillars brought into the house by my brothers; but our dear Aunt Ruth took us on walks and always knew the name of everything we saw and made us love the countryside and gardening—most consoling to a city child.

So thank you for the "Echoes of the Past" and the other well-written, up-to-date articles in the September issue of *The Garden Journal.*

JULIA T. EMERSON
Somers, New York

Records of The New York Botanical Garden reveal that Miss Emerson, born on April 6, 1877, was graduated from the College of Pharmacy, Columbia University, in 1898; studied at Teachers College, Columbia, in 1898-1899; and also spent some time at the Marine Laboratory, Woods Hole, Massachusetts, in 1899, 1901, 1903, and 1904. While a student at Columbia University, Miss Emerson spent, as she stated, many hours at The New York Botanical Garden; and in 1903-1904 was a laboratory assistant at the Garden. Her specialty was the taxonomy of mosses, and she is author of a number of scientific publications. In 1913 she was co-author with Elizabeth Britton of "*Andreaeaceae*" in *North American Flora.* Another interesting contribution by Miss Emerson appeared in *Torreya* (1919) on "Botanical Observations in Iceland and Spitzenbergen."

BOOK REVIEWS

PLANT PROPAGATION. Hartmann, Hudson T. and Dale E. Kester. 559 pages, indexed, illustrated. Prentice-Hall, Inc., New York. 1959. $8.75.

Within the past five years six books on plant propagation have been published, and while all of them are good, this, in my opinion, is one of the best. Designed primarily as a college textbook, it therefore covers a wide range of subjects associated with plant propagation, but does not deal with any of them too exhaustively. One of its most valuable aspects is the extended list of supplementary reading and references given at the end of each chapter. This means that any serious student of plant propagation can widen his knowledge almost indefinitely by following up the references given. The book is clear, concise, up-to-date, and authoritative.

The only serious criticism that one could find is the use of colloquial rather than correct botanical names in describing plants. Surely a book aimed at the teaching of young plantsmen should rise above the colloquial level. If it is felt that these common names have to be mentioned, then the index is sufficient. This minor criticism does not detract from the true value of the book, and it is one which should be on the shelves of any keen horticulturist.

JAMES S. WELLS
Red Bank, New Jersey

THE GRAFTER'S HANDBOOK. Garner, R. J. 249 pages, indexed, illustrated. Oxford University Press, New York. 1959. $5.75.

Since its original publication, THE GRAFTER'S HANDBOOK has been the only authoritative and standard work dealing with this aspect of plant propagation. The revised edition simply maintains and further establishes this book as an integral part of any good horticultural library. While the text is largely built around Mr. Garner's work at the Experimental Station at East Malling, England, where fruit is his main interest, the techniques and methods described and illustrated with very clear line drawings are applicable to any type of horticultural plant for which grafting is necessary. This is an extremely valuable book.

JAMES S. WELLS
Red Bank, N. J.

ILLUSTRATED FLORA OF THE PACIFIC STATES, Volume IV. Abrams, Le Roy, and Roxana Stinchfield Ferris. 732 pages. Illustrated, indexed. Stanford University Press, Stanford, California. 1960. $17.50.

This volume, covering *Bignoniaceae* to *Compositae* in the Englerian sequence, brings to a close the four-volume *Illustrated Flora of the Pacific States.* As in each of the previous volumes, it includes the description,

(Continued on page 243)

BRIEF NOTES ON RECENT BOOKS

By Elizabeth C. Hall

Miss Hall is the Librarian of The New York Botanical Garden.

FLOWER ARRANGEMENT

DECORATING WITH SEED MOSAICS, CHIPPED GLASS, AND PLANT MATERIALS. Van Rensselaer, Eleanor. 214 pages, illustrated, part colored, bibliography, indexed. D. Van Nostrand Co., Princeton, N. J. 1960. $5.95.

Ideas galore abound in this new book by the author of *Decorating with Pods and Cones.* A generous list of sources of supplies is most helpful.

FLORAL DECORATIONS FOR YOUR CHURCH. Hunt, Fern Bowers. 223 pages, illustrated, part colored, glossary, bibliography, indexed. Chilton Co., Philadelphia, 1960. $6.95.

This excellent treatment of the subject includes chapters on symbolism of plant materials, the teaching of children, Christmas customs, decorations for special occasions, and the church garden.

JAPANESE FLOWER ARRANGEMENT; CLASSICAL AND MODERN. Sparnon, Norman J. 264 pages, illustrated, part colored, bibliography, glossary, indexed. Charles E. Tuttle Co., Rutland, Vt. 1960. $15.00.

The classical Ikenobo and the modern Sogetsu schools of Japanese floral art are described and illustrated. A particular feature is the appendix which includes the botanical as well as vernacular English and Japanese names of plants.

JAPANESE FLOWER ARRANGEMENT IN A NUTSHELL; A PRIMER. Allen, Ellen Gordon. 55 pages, illustrated, bibliography. Charles E. Tuttle Co., Rutland, Vt. 1959. $1.00.

Written for the beginner by an American who studied Ikebana while living in Japan.

THE FLOWER ARRANGEMENT CALENDAR: 1961. Wilson, Helen Van Pelt. Unpaged, illustrated. M. Barrows and Co., New York. 1960. $1.50.

A delightful engagement book with a picture of a new arrangement for each week of the year.

CHILDREN'S BOOKS

CREATURES OF THE NIGHT. Sterling, Dorothy. 125 pages, illustrated, part colored, bibliography, indexed. Doubleday and Co., Garden City, N. Y. 1960. $2.95.

An authoritatively written book to guide you into the world of beetles, katydids, moths, and crickets without leaving your doorstep. The illustrations by Winifred Lubell are really wonderfully done.

THE NATURAL HISTORY OF THE SOUTHWEST. Burns, William A., ed. 141 pages, illustrated, part colored, indexed. Franklin Watts, Inc., New York. 1960. $4.95.

A beautifully illustrated work written by members of the staff of the Arizona-Sonora Desert Museum under the direction of Dr. William A. Bruns of the American Museum of Natural History. Peggy Pickering Larson has given a fascinating description of the flora.

GREAT MYSTERIES OF THE EARTH. Hapgood, Charles H. 72 pages, illustrated. G. P. Putnam's Sons, New York. 1960. $2.75.

The what's, why's and how's of some of the earth's phenomena—earthquakes, drifting continents, the last great ice cap, volcanoes.

ROCKS AND THE WORLD AROUND YOU. Clemons, Elizabeth. 109 pages, illustrated, bibliography, indexed. Coward-McCann, Inc., New York. 1960. $3.50.

For the young collector and would-be collector of rocks and minerals. The illustrations would be far more helpful, if they were in color.

STATE TREES. Earle, Olive L. Unpaged, illustrated by the author. William Morrow and Co., New York, 1960. $2.50.

Companion volume to Miss Earle's *State Birds and Flowers.* The text is simply written. The illustrations of the trees and their leaves, flowers, and fruits are outstandingly lovely.

TIMBER: FARMING OUR FORESTS. Buehr, Walter. 96 pages, illustrated by the author, indexed. William Morrow and Co., New York. 1960. $2.75.

Although written for the 10-14-year age group, this is good informing reading for oldsters as well.

WONDERS AT YOUR FEET; A NEW WORLD FOR EXPLORERS. Cosgrove, Margaret. 64 pages, illustrated by the author, indexed. Dodd, Mead and Co., New York. 1960. $2.95.

Another of the fascinating "Wonders Book" series by the author of *Wonders of the Tree World, Wonders under a Microscope,* and others. This one has a charming chapter introducing algae, fungi, mosses, club mosses, lichens, horsetails, liverworts, and ferns to the young reader.

GARDENS, GARDEN PLANTS and LAWNS

GARDEN IDEAS AND PROJECTS; A HANDBOOK FOR HOME GARDENERS. Whittemore, Richard D., ed. 532 pages, illustrated. Doubleday and Co., Garden City, N. Y. 1959. $3.95.

A welcome return—much of the contents were previously published in booklets which went out-of-print. Among the vast number of subjects covered are: garden structures and equipment, special types of gardens, garden calendar for many different climatic regions and pronouncing dictionary of plant names.

A BIBLE GARDEN. Goldsmith, Margaret O. 16 pages, illustrated. Abingdon Press, New York. 1960. $.50.

Particular emphasis is given to Bible plants for indoor and terrace gardens with suggestions also of the more hardy kinds for out-of-doors. The list of sources for plants and containers is a bonanza.

BUDGET LANDSCAPING. Lees, Carlton B. 152 pages, illustrated, bibliography, indexed. Henry Holt and Co., New York. 1960. $3.95.

Chiefly a number of "case histories" of landscaping particular houses. Pleasant enough to read and helpful but not really very "meaty".

CACTI. Shurly, E. 160 pages, illustrated, part colored, indexed. Abelard-Schuman, Ltd., New York. 1960. $4.50.

An authoritative text on the growing of cacti in Great Britain with little emphasis on the botanical aspects of the group. Very nice colored and black and white illustrations.

CONTEMPORARY PERENNIALS. Cumming, Roderick W. and Lee, Robert E. 363 pages, illustrated, glossary, indexed. The Macmillan Co., New York. 1960. $6.95.

The proprietor of Bristol Nurseries and a well-known Cornell professor of floriculture have given the home gardener an up-to-date, knowledgeable, and practical guide to the growing of worthwhile perennials. The tabulation of blooming period, color, foliage, height, suitable location is good.

EASY WAYS TO A BEAUTIFUL GARDEN, Gannon, Ruth. 165 pages, illustrated, indexed. The Studio Publications, The Viking Press, New York. 1959. $5.00.

Simple planting diagrams, evaluations, and recommendations of specific varieties make this little book a useful aid for the beginning and almost-beginning gardener.

FRAGRANCE AND FLAVOUR; THE GROWING AND USE OF HERBS. Hemphill, Rosemary. 104 pages, illustrated. Charles T. Branford Co., Newton, Mass. 1960. $3.00.

Full of so many herby things—herb teas, aromatic baths, fragrant gift suggestions, and herb recipes. One chapter is devoted to the growing, harvesting, and using of twenty-five herbs, and there is a section for the indoor gardener.

HOW TO GROW ROSES; 2nd ed. Edwards, John Paul and Editorial Staffs of Sunset Magazine and Books. 88 pages, illustrated, part colored, indexed. Lane Book Co., Menlo Park, Cal. 1960. $1.75.

A very usable, comprehensive guide.

IRIS FOR EVERY GARDEN; rev. ed. Mitchell, Sydney. 216 pages, illustrated, part colored, bibliography, indexed. M. Barrows and Co., New York. 1960. $4.95.

The 1949 edition has been thoroughly revised and updated "with Boswellian fidelity" by Molly Price, an ardent admirer of the late Professor Mitchell, and herself well known in iris circles. There is a fine foreword written by F. W. Cassebeer, eminent breeder and grower of iris.

LAWNS FOR GARDEN AND PLAYING FIELD. Dawson, R. B. 176 pages, illustrated, glossary, indexed. Penguin Books, Baltimore, 1960. $1.45.

A good book for those it is designed to serve, but the making and maintenance of lawns in North America differs so much from the British procedures with which this text deals that the book is of limited use to Americans.

SUNSET LAWN AND GROUND COVER BOOK; 2nd ed. Sunset Magazine Staff. 95 pages, illustrated. Lane Book Co., Menlo Park, Cal. 1960. $1.75.

Text, photographs, diagrams, and tables—very well done.

THE JUDGING OF ROSES. Lewis, C. H. 89 pages, illustrated, indexed. American Rose Society, Columbus, Ohio. 1960. $3.00.

Adopted as the official judges' manual by the Board of Directors of the American Rose Society—no more need be said.

THE ROMANCE OF DAFFODILS. Brumbach, William C. 47 pages, Greenwich Book Publishers, New York. 1959. $2.00.

A very interesting, easily readable, and distinctly personal account of one man's horticultural hobby—the seeking of old-time narcissus varieties and of knowledge about them.

PLANTS AND ENVIRONMENT

PLANTS AND ENVIRONMENT; A TEXTBOOK OF PLANT AUTECOLOGY; 2nd ed. Daubenmire, R. F. 422 pages, illustrated, maps, bibliography, indexed. John Wiley and Sons, New York. 1959. $6.95.

A revised edition of the 1947 text. The extensive bibliography has been updated and expanded.

THE VEGETATION OF WISCONSIN; AN ORDINATION OF PLANT COMMUNITIES. Curtis, John T. 657 pages, illustrated, maps, tables, bibliography, indexed. University of Wisconsin Press, Madison. 1959. $7.50.

A detailed ecological survey of plant life in Wisconsin viewed historically and currently. Conservationists and students of plant ecology will find this a definitive work.

TREES AND FORESTRY

A POCKET GUIDE TO TREES. Platt, Rutherford. 256 pages, illustrated, indexed. Washington Sq. Press, New York. 1960. $.50.

Original title: *American Trees; a Book of Discovery*. Now in a handy size and still embellished with numerous line drawings and photographs of our trees, both native and introduced.

AN INTRODUCTION TO AMERICAN FORESTRY; 3rd ed. Allen, Shirley W. and Sharpe, Grant W. 466 pages, illustrated, maps, bibliographies, indexed. McGraw-Hill Book Co., New York. 1960. $7.95.

An up-to-date revision of the 1950 edition with many of the chapters rewritten and new illustrations added. The lists of American and Canadian forestry schools are most useful.

BONSAI; JAPANESE MINIATURE TREES; THEIR STYLE, CULTIVATION, AND TRAINING. Yashiroda, Kan. 166 pages, illustrated, indexed. Charles T. Branford Co., Newton, Mass. 1960. $5.75.

The author, a Japanese nurseryman, studied at Kew and at The Brooklyn Botanic Garden. He has produced an authoritative, comprehensive, and well illustrated book on the art of growing miniature trees. Bonsai culture of chrysanthemums in the cascade style is included in this excellent work.

DECORATIVE TREES AND SHRUBS. Schwarzenbach, Hans. 63 pages, 60 colored plates, indexed. A Studio Book, The Viking Press, New York. 1960. $20.00.

A beautiful work which includes plates in seven colors after the originals by Hans Schwarzenbach; a descriptive text by Hans Zaugg and Hans Coaz, translated and adapted by Herbert L. Edlin. According to the translator's preface, all the trees and shrubs depicted can be obtained from American nurserymen and are hardy in most parts of North America.

MUNICIPAL STREET TREES; A MANUAL FOR PUBLIC OFFICIALS AND MUNICIPAL FORESTERS, 58 pages, illustrated, bibliography. League of Wisconsin Municipalities, Madison. 1960. $3.00.

Exactly what its title and subtitle imply and, as such, useful and of interest to the group to whom it is addressed.

NATURE STUDY AND MISCELLANEOUS WRITINGS

DECORATIONS FOR CHRISTMAS. Ray, Grace Baker. Unpaged, illustrated. The author, 738 Sheridan Drive, Lancaster, Ohio. 1960. $2.00.

An accredited flower show judge offers over a hundred suggestions for Christmas. The uses of "simple, easy-to-get materials" from the garden, fields, and woods are emphasized.

GREAT AMERICAN RIVERS AT A GLANCE. Heath, Monroe. 35 pages, illustrated. (The Great American Series, vol. 8) Pacific Coast Publishers, Redwood City, Cal. 1960. $1.00.

Useful facts concerning thirty important rivers.

IN THE LAND OF THE QUETZAL FEATHER. Morton, Friedrich. 208 pages, illustrated, Devin-Adair Co., New York. 1960. $4.50.

A chatty account of life among the Indians of Guatemala by a coffee plantation manager. Brief mention is occasionally given of the flora and fauna.

JOURNEY INTO SUMMER; A NATURALIST'S RECORD OF A 19,000-MILE JOURNEY THROUGH THE NORTH AMERICAN SUMMER. Teale, Edwin Way. 366 pages, photographs by the author, indexed. Dodd, Mead and Co., New York. 1960. $5.95.

Another American season from Edwin Way Teale's pen and camera—this time it's summer in twenty-six states. Each page is filled with the keen observations of this gifted nature writer, who doesn't hesitate to fortify his own statements by calling to the attention of his readers the writings and teachings of other naturalists.

SACHETS AND DRY PERFUMES; a Practical Handbook for the Making of Sachets and Dry Perfumes at Home with Easily Obtained Materials, together wtih Much Curious History, Anecdote and Lore of Flowers, Herbs, Spices, and Fragrances. Karpilow, Shelley. 31 pages, illustrated. The Porpoise Bookshop, San Francisco. 1960. $.25.

This will interest the herb enthusiasts.

THE INCAS OF PEDRO DE CIEZA DE LEON. Von Hagen, Victor Wolfgang, ed. Translated by Harriet de Onis. 397 pages, illustrated, maps, bibliographical notes, indexed. Univ. of Oklahoma Press, Norman. 1959. $5.95.

Stimulating background reading for those seeking source material on Peruvian history and the way of life of the Incas.

THE NATURE PROGRAM AT CAMP; A BOOK FOR CAMP COUNSELORS. Nickelsburg, Janet. 137 pages, illustrated, bibliographies. Burgess Publishing Co., Minneapolis. 1960. $3.50.

This should be "required reading" for all nature counselors. It is rich in ideas, precautions, and sound advice. Its extensive list of books and bulletins on all phases of nature study and teaching is splendid.

BIOGRAPHY

ASA GRAY: 1810-1888. Dupree, A. Hunter. 505 pages, illustrated, bibliography, indexed. The Belknap Press of Harvard Univ. Press, Cambridge, Mass. 1959. $7.50.

Botany plays an important role in this scholarly biography, but there is much, much more. Asa Gray, a staunch supporter of Darwin, lived in an exciting era, and his life is here described with a vivid national and international background.

DANCE OF THE TREES (The Adventures of a Forester); with a foreword by Sir Arthur Bryant. Baker, Richard St. Barbe. 192 pages, illustrated. Wellington Books, Belmont, Mass. 1960. $3.50.

The founder of the Society of The Men of the Trees, internationally known for his numerous conservation projects, tells of his adventurous life among the trees and forests of many lands.

OF NATURE, TIME AND TEALE; A BIOGRAPHICAL SKETCH OF EDWIN WAY TEALE. Dodd, Edward H., Jr. 63 pages, illustrated. Dodd, Mead and Co., New York. 1960. $3.00.

A gem of a book, with pleasing typography and physical make-up. Mr. Dodd, a skilled writer, has made a delightful contribution.

DIRECTORIES, DICTIONARIES, HANDBOOKS

A PICTORIAL GUIDE TO AMERICAN GARDENS. Frohman, Louis H. and Elliot, Jean. 368 pages, illustrated, part colored, indexed. Crown Publishers, New York. 1960. $5.95.

A generously illustrated directory of fifteen hundred gardens, public and private, in the United States, including Alaska and Hawaii. Most helpful information is given about location, hours, and seasons for public inspection, and entrance fees. The index to flowers, trees, and shrubs is especially useful.

DICTIONARY OF ECONOMIC PLANTS. Uphof, J. C. Th. 400 pages, bibliography. Hafner Publishing Co., New York. 1959. $9.75.

Over six thousand species of plants useful to man are dealt with. Brief descriptions, with notes on geographical distribution, products, and uses are given. Cross references from vernacular to botanical names and an extensive bibliography arranged by subjects are important features.

HANDBOOK FOR GARDEN CLUBS. 89 pages, indexed. The Ohio Association of Garden Clubs, Inc., Victor H. Ries, Secretary, 1241 Lincoln Road, Columbus 12, Ohio. $1.50.

Congratulations to the contributors to this booklet which offers many ideas and much information.

THE GARDENER'S DIRECTORY. Stephenson, J. W. 454 pages, bibliography. Hanover House, Garden City, N. Y. 1960. $3.95.

A most comprehensive and accurate compilation of information about horticultural organizations, places of horticultural interest (including a guide for travelers), sources for plants and seeds, lists of books and periodicals, libraries, calendar of horticultural events. Very well done.

BOOKS FOR CHRISTMAS

Books are a happy choice for Christmas gifts—a reminder of your thoughtfulness the year round.

Books reviewed in the pages of *The Garden Journal*, or any book on botany, gardening, flower arrangement, natural science, or kindred subjects may be ordered through Book Service.

Members are entitled to a ten per cent discount on the list price. Please send check or money order payable to The New York Botanical Garden with your order.

NEWS, NOTES and COMMENTS

Activities of the Director and Staff. Within the past several months, Dr. William C. Steere, Director, attended the annual meeting and dinner of the American Association of Botanic Gardens and Arboreta in Boston; meetings in Washington, D. C., of the National Research Council and of a panel of the National Science Foundation; the dedication of the Climatron at the Missouri Botanical Garden in St. Louis. He gave the address as retiring president of the Botanical Society of America on "Botanical Problems in Arctic America;" presented a paper on "Ten Years of Progress in Bryological Work in the Arctic" before the American Bryological Society; presented a paper before the Teaching Section of the Botanical Society of America, on "The Botanical Garden as an Outdoor Laboratory for Taxonomy" in the symposium entitled "The Botanical Garden as an Outdoor Laboratory for Teaching."

Dr. Steere is co-editor with Dr. Willis H. Johnson of a book on biology for advanced high school and undergraduate college students, to be published by Henry Holt and Company.

T. H. Everett, Assistant Director (Horticulture) and Curator of Education, recorded three radio interviews for broadcasting on Ruth Alampi's Saturday morning program on WNYC.

Dr. H. W. Rickett, Acting Assistant Director (Botany) and Bibliographer, spent several days in Cambridge, Massachusetts, using the facilities of the modern air-conditioned library of the Gray Herbarium and Arnold Arboretum. Dr. Rickett recently completed editing two issues of *Memoirs of The New York Botanical Garden*. The first, consisting of the thesis "A Revision of *Spathiphyllum* (*Araceae*)" by George S Bunting, prepared for his doctorate, is now in proof; the second issue, devoted to "Botany of the Guayana Highlands," Part IV, cont., by Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, is in the hands of the printers.

Dr. Arthur Cronquist, Curator, is spending a month in Costa Rica under a grant from George R. Cooley of Chinsegut Hill, Florida. Dr. Cronquist's trip to Costa Rica is for the purpose of getting a first-hand look at tropical vegetation and the living representatives of a number of plant families that are confined to the tropics. He chose Costa Rica because it provides a combination of variety and accessibility. To quote Dr. Cronquist, "I am not trying to turn myself into a tropical botanist, but I do want to pay some attention to a heretofore neglected field of my botanical education."

Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium, has been appointed Editor-in-Chief of *Mycologia* by the Council of the Mycological Society of America effective immediately.

Mary Fleming, Technical Assistant in the Cryptogamic Herbarium, collected a number of specimens on her recent trip to Trinidad for Dr. Rogerson and Dr. Maguire.

Dr. David J. Rogers, Curator of Economic Botany, has received a grant of $14,200 from the National Science Foundation for the systematic investigation of *Manihot esculenta* and related species. The grant is for three years. Dr. Rogers attended the meeting in Washington, D. C., of the National Research Council about processing biological data with electronic machines and the meeting in New York City of the Society for Economic Botany.

Dr. Richard M. Klein, Alfred H. Caspary Curator, was elected representative of the Development Section of the Botanical Society of America on the editorial Board of the *American Journal of Botany*. He attended the meeting in New York City of the Council of the Society for Economic Botany and spent five days at the Oak Ridge Institute for Nuclear Studies where he and Mrs. Klein gave a seminar on "The Interaction of X-rays and red and far-red light on growth and mutation of *Neurospora*." Mrs. Klein is an instructor in microbiology at the Albert Einstein College of Medicine of Yeshiva University.

Dr. Elsa H. J. O'Donnell-Alveda, who is a visiting investigator in the Research-Laboratory under a grant from the Damon Runyon Fund, attended the International Cell Biology Conference in Paris this summer.

Dr. Mariafranca Carpaneda Morselli, a volunteer research assistant in the Research Laboratory, is working with Dr. Klein and Dr. O'Donnell-Alveda in physiological cytology. Dr. Morselli received gymnasium and lyceum diplomas from the Giovanni Parini Lyceum in Milan, Italy in 1941; Ph.D. in botany and natural sciences from the University of Milan in 1946. Dr. Morselli spent two years reading general sciences and mathematics at the Professional School in Milan. She taught botany, zoology, and economic botany at Quincy College in Quincy, Illinois, while at the same time she carried on research on *Chlorella vulgaris* under the supervision of the Botany Department of Northwestern University.

Dr. P. P. Pirone, Plant Pathologist, attended the Nassau County Turf Demonstration at East Meadows, Long Island.

Dr. Herman L. Becker, Visiting Research Associate, has received a grant of $40,000 for continued research in the Tertiary Ruby Flora of Montana with emphasis on the new assemblage called the York Ranch Flora. The grant is for three years. Through field work in Montana during 1959, sponsored by the National Science Foundation, a new floral assemblage of late Middle Eocene age was expanded, studied, described, and published by Dr. Becker under the title "The Mormon Creek Flora from the Upper Ruby River Basin in Southwestern Montana" in *Palaeontographica* B, 107, No. 4-6, pp. 83–126, pls. 18–35, August 1960. Mr. Becker has also had published "The Ruby Flora of Southwestern Montana" by the Billings Geological Society, *Guide Book 1960*, for the West Yellowstone Earthquake Field Conference, September 7–10, 1960. On the press are "Additions to the Ruby Paper Shale Flora of Southwestern Montana," *Bulletin of The Torrey Botanical Club*, September-October 1960, and "The Oligocene Ruby Paper Shale Flora of Southwestern Montana," Geological Society of America, *Memoir*, November 1960. This work was partially facilitated by a grant for the summer of 1957 by the Geological Society of America. When abroad this summer, Dr. Becker presented a paper on "The State of American Palaeobotany with Special Reference to Climate Interpretation" by invitation of the Hebrew University at Jerusalem, Israel, and a paper on "New Species from the Oligocene Ruby Flora of Southwestern Montana" at the twenty-first International Geological Congress in Copenhagen, Denmark.

Dorothy Ebel Hansell, Editor of *The Garden Journal*, attended the opening of *Flower Grower's* exhibition of photographs by Samuel H. Gottscho and members of the magazine's staff held in Grand Central Terminal, New York City, under the sponsorship of Eastman Kodak Company; the luncheon at the Tavern on the Green, Central Park, New York City, when Virginia Metalcrafters introduced a new garden tractor; the fiftieth anniversary of the National Association of Gardeners held in Asbury Park, New Jersey; visited Sterling Forest Gardens, Tuxedo, New York, to view the display of twelve thousand chrysanthemum plants and the orchid show in the International Pavilion arranged by the East-

Dr. David Rogers, Curator of Economic Botany (left) and Dr. Harold W. Rickett, Acting Assistant Director (Botany) and Bibliographer (right) entertain Dr. G. Edward Nicholson, Project Officer, Research and Agricultural Section, Special Funds, U. N. (second from left) and Sir Joseph Hutchinson, F. R. S., Draper Professor of Agriculture, University of Cambridge, and Special Consultant to the U. N., at the Snuff Mill in The New York Botanical Garden.

Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium, supervised the students as they studied fungi.

ern Orchid Growers. Mrs. Hansell was a judge at the flower shows of Grange 141 in Millington, New Jersey, and of the Royal-Globe Insurance Group in New York City, and the show of the American Dahlia Society and the New Jersey Dahlia Society in Paramus, New Jersey.

Three graduate students came to the Garden in September 1960. Moneta Engvall who received B.A. in anthropology from Washington State University, and Gary C. Irvine, who received M.A. in botany from Syracuse University, are graduate assistants in the Herbarium; Fred Hille, who received M.A. in botany from the University of Kentucky, is research assistant to Dr. Cronquist under the latter's grant from the National Science Foundation.

1960 Summer High School Institute. Parents of participants in the 1960 Summer Institute for High School Students are most appreciative of the unique privilege their sons and daughters enjoyed. The five weeks at the Garden enlarged their vision of the opportunities open in botanical and horticultural pursuits. More than one parent said that he had been infected by his son's or daughter's enthusiasm and that he had caught a glimpse of the wonders of plant life.

One of the students has applied for a 1961 scholarship to the Roscoe B. Jackson Memorial Library at Bar Harbor, Maine; another is going to study genetics, another marine biology, and a fourth biochemistry. Several of the students have horticultural backgrounds. One is the granddaughter of a retail florist, and her uncles are engaged in landscape contracting. Another is the granddaughter of the late P. M. Koster, well-known plantsman of Bridgeton, New Jersey, and of Bagatelle Nurseries, Huntington, Long Island.

The students were tendered a luncheon at the Snuff Mill at the close of the Institute on August 12, 1960. A number of the parents were present. Dr. Cronquist, who directed the Institute, extended greetings for Dr. William C. Steere, Director of The New York Botanical Garden. Dr. Steere, who returned from Alaska on August 10, was called to Washington. Dr. Cronquist introduced George Schwartz, who assisted in directing the Institute, and members of the Garden's staff who instructed. Mr. Schwartz is a biology teacher at Forest Hills High School, New York.

After Mr. Schwartz presented the Certificates of Participation to the students, Walter Westman, on their behalf, presented a copy of *Light and Plant Growth* by R. Van Der Veen and G. Meijer to the Library of The New York Botanical Garden. He said: "We present to you this gift, really only a very small part of our appreciation of the efforts of all those connected with the Summer Institute and the Garden's staff. We wished to contribute something which could be of use to all those at the Botanical Garden and to future students here. I present this to you, as an addition to The New York Botanical Garden library, with great happiness, on behalf of the students of the 1960 Summer Institute."

The book is inscribed: "This volume was presented to the Library of The New York Botanical Garden by the students of the 1960 Summer Institute with sincere appreciation of the dedicated efforts of the staff."

Dr. Richard M. Klein, Albert H. Caspary Curator, showed the students protoplasmic streaming in *Elodea*.

Dr. P. P. Pirone, Plant Pathologist, explained to some of the students the pests that attack junipers.

Visitors to the Garden. Within recent months the following have visited The New York Botanical Garden:

Dr. Germain van Schoor, University of Brussels, Brussels, Belgium.

Dr. A. Tyznik, Morton Arboretum, Lisle, Ill.

Dr. Louis Nickell, Chas. Pfizer and Co., Chester, Conn.

R. Henry Norweb, Jr., The Holden Arboretum, Cleveland, O.

Dr. Allan Karn, International Business Machines Co., San Jose, Cal.

Dr. Soetomo Soerohalchko, Botanic Gardens, Bogar, Indonesia.

Mervin Oakes, Biology Dept., Queens College, Flushing, L. I.

T. A. Nosworthy, President, Bronx Savings Bank, New York, N. Y.

Carlo Paterno, New York, N. Y.

Mr. and Mrs. Gordon Foster, Bell Laboratories, Murray Hill, New Jersey.

Dr. Fred J. Seaver, Curator Emeritus, The New York Botanical Garden, Winter Park, Fla.

Prof. André Aubreville, Director, Phanerogamic Laboratory, Museum of Natural History, Paris, France.

Dr. Norman W. Pirie, Director, Rothamsted Experimental Station, Harpenden, Herts, England.

Dr. Tobías Lasser, Instituto Botánico, Caracas, Venezuela.

Dr. Leslie R. Holdridge, San José, Costa Rica.

Dr. Frank Kern, Dean Emeritus of the Graduate School of Penn State University and formerly Chairman of the Department of Botany, University Park, Pa. While Dr. Kern was at Columbia University in the early years of the present century, he did research at the Garden. A world authority on the cedar-apple rust, he is now engaged in a revision of his monograph on *Gymnosporangium* that was originally published in 1911.

Gifts to Library. Colleagues of the late Paul Hoffman, Editor of *Suburbia Today*, contributed one hundred and twenty-five dollars for the purchase of books for the Library of The New York Botanical Garden in his memory.

Melville C. Grosz presented files of *The National* (now *The American*) *Horticultural Magazine, Flower Grower, Popular Gardening, Horticulture, The Farm, New York State Conservationist,* and *Vermont Life;* and Dr. Caroline K. Allen complete volumes of the *National Geographic* from 1927 to date.

Postcards of Scenes at The New York Botanical Garden. A set of postcards—of the Museum and Administration Building with Japanese weeping cherry in bloom; the water-lily pool in the Conservatory courtyard; the chrysanthemum garden; and colorful fall foliage—will be sent upon request to members of the Garden who furnish a stamped self-addressed envelope.

R. Gordon Wasson, Vice President of The Morgan Guaranty Trust Co. of New York and Treasurer of The New York Botanical Garden, delivered the annual invitational lecture of the Mycological Society of America on "The Hallucinogenic Fungi of Mexico; an inquiry into the origins of the religious idea among primitive people," in Stillwater, Oklahoma, on August 30, 1960.

Dr. Arthur Cronquist, Curator, directed the 1960 Summer Institute for High School Students at The New York Botanical Garden.

The Torrey Botanical Club opened its fall-winter 1960-1961 season on October 8, 1960, with a field trip in the afternoon to The Brooklyn Botanic Garden to see the autumn flora, with G. Kalmbacher as leader, and a summer experience meeting after an informal buffet. Dr. Annette Hervey was in charge of arrangements and presided at the meeting.

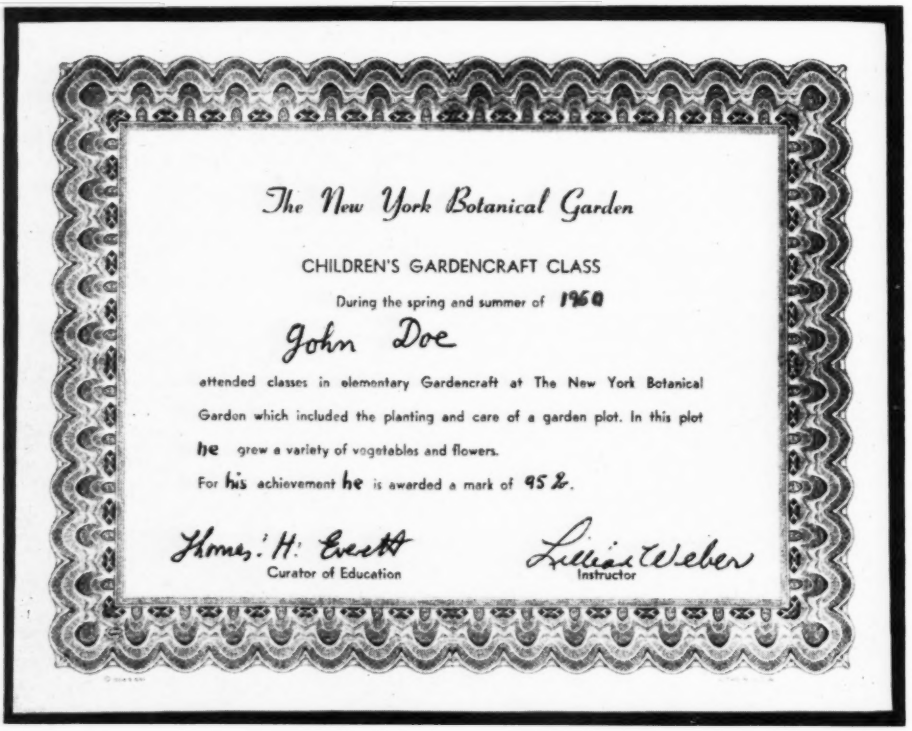
On October 25, 1960, a special program in honor of the late Dr. Bernard O. Dodge, Plant Pathologist Emeritus of The New York Botanical Garden, was held in Philosophy Hall, Columbia University. The significance of Dr. Dodge's work for plant pathology was discussed by Dr. P. P. Pirone, Plant Pathologist at The New York Botanical Garden; for mycological genetics by Dr. Olive Lindsay, Professor of Botany, and Dr. Francis J. Ryan, Professor of Zoology, both of Columbia University; for biochemical genetics by Dr. Edward L. Tatum, Professor at Rockefeller Institute for Medical Research. Dr. William J. Robbins, Director Emeritus of The New York Botanical Garden, was chairman of the meeting.

On November 1, 1960, in Schermerhorn Hall Extension at Columbia University, Dr. Richard Goodwin of the Department of Botany of Connecticut College, gave a talk on "Natural Areas, Their Preservation and Use."

On November 15, 1960, in Larkin Hall, Fordham University, Dr. Charlotte Avers of Rutgers University will discuss "Histochemical Localization of Enzyme Activities in Living Cells."

High school students studied microorganisms in the Research Laboratory under Dr. Annette Hervey, Research Associate.

Mrs. Lillian Weber, Instructor, inspected the plot of one of the Gardencrafters, while John Dowling assisted another Gardencrafter in weeding.



The New York Botanical Garden

CHILDREN'S GARDENCRAFT CLASS

During the spring and summer of 1960

John Doe

attended classes in elementary Gardencraft at The New York Botanical Garden which included the planting and care of a garden plot. In this plot he grew a variety of vegetables and flowers.

For his achievement he is awarded a mark of 95%.

Thomas H. Everett
Curator of Education

Lillian Weber
Instructor

Some of the one hundred plots which were cultivated by Gardencrafters at The New York Botanical Garden during the summer of 1960.

Graduation of 1960 Gardencrafters. Eighty-five of the one hundred children who were instructed in practical gardening from March 25 through late August and tended plots—each child had his own plot—received certificates at exercises held on August 27, 1960. In addition, first prizes were awarded in the beginners' group to John Dzurich for the boys and to Marilyn Maiberger for the girls; in the advanced group first prizes were awarded to Kenneth Foley for the boys and to Louise Park for the girls. This is the fourth year that Louise has participated in the Gardencraft classes, and she has been a prize-winner each time.

Mrs. Lillian Weber, one of the instructors, acted as "mistress of ceremonies." Miss Nancy Callaghan, another instructor, showed colored slides of and spoke on the season's work and accomplishments. John Dowling, who also assists in the Gardencraft program, called the roll as Mrs. William C. Steere presented the certificates in the presence of some two hundred parents and friends.

Special Symposium will be sponsored by The Torrey Botanical Club, in conjunction with the meetings of the American Association for the Advancement of Science to be held in New York City this December.

The symposium on "Fundamental Developments in Plant Growth" will be held at the Hotel Biltmore, December 27, 1960. Dr. Annette Hervey, Research Associate at The New York Botanical Garden, has arranged an excellent all-day program in which the following will participate: in the morning, Dr. Daniel Arnon of the University of California on "Changing Concepts of Photosynthesis," Dr. John Mitchell of the U. S. Department of Agriculture on "Fundamental Developments in the Field of Plant Growth Regulators," Dr. N. Edward Tolbert of Michigan State University on "Alteration of Plant Growth by Chemicals," and Dr. Seymour H. Hutner of Haskins Laboratories on "'Plant-Animals' as Experimental Tools for Growth Studies"; in the afternoon, Dr. Harry A. Borthwick of the U. S. Department of Agriculture on "The Photoperiodic Control of Flowering," Dr. William S. Hillman of Yale University on "Test Tube Studies on Flowering," Dr. Thomas H. Jukes of the American Cyanamid Co. on "Relation of Antimetabolites to Plant Growth," Dr. Walter Tulecke of Boyce Thompson Institute for Plant Research on "Recent Progress and the Goals of Plant Tissue Culture." Dr. Paul Burkholder, Director of Research of Kitchawan Laboratories of The Brooklyn Botanic Garden, will be chairman of the morning session; Dr. George McNew, Managing Director of the Boyce Thompson Institute for Plant Reearch, will be chairman of the afternoon session.

At the luncheon, Dr. Charles Berger, Chairman of the Department of Biology of Fordham University, and Dr. William C. Steere, Director of The New York Botanical Garden, will speak informally to members and guests as President and Vice President, respectively, of The Torrey Botanical Club.

International Rhododendron Conference, under the auspices of the American Rhododendron Society, will be held in Portland, Oregon, May 12-14, 1961. Speakers from abroad include: Dr. H. R. Fletcher, Regius Keeper of the Royal Botanic Garden, Edinburgh; Dr. F. P. Knight, Director of

the Royal Horticulture Society Gardens, Wisley; Sir Giles Loder, official representative of the Royal Horticultural Society; H. J. Grootendoorst, Boskoop, Holland; Dietrich Hobbie, Germany; and Dr. J. S. Yeates of Massey College, New Zealand. Speakers from Pennsylvania, New Jersey, Maine, Ohio, Washington, D. C., and the three Pacific Coast states will present the latest ideas on culture, breeding, and new varieties in the different sections of the United States. The National Test Garden of the American Rhododendron Society is at its best on these dates, and the rhododendron show that is held annually in the Test Garden is scheduled to coincide with the conference. Information on tours, registration, and hotel accommodations may be had from Mrs. Ruth M. Hansen, 3514 N. Russet Street, Portland 17, Oregon.

The National Association of Gardeners, whose membership is composed of professional gardeners from private estates, botanical gardens, arboretums, horticultural foundations, and cemeteries, celebrated its fiftieth anniversary in a three-day conference at Asbury Park, New Jersey, September 13-15, 1960. Among the speakers were Ralph S. Bailey, Garden Editor of *House and Garden;* Ray E. Harmon, former Essex County (New Jersey) Agricultural Agent; Percy Adams, Superintendent of the Lessing J. Rosenwald Estate in Jenkintown, Pennsylvania; Miss Gena Thames of the Home Economics Department of Rutgers University; and Miss Michiki Tataki of Japan, now a scholarship student at Columbia University.

The Association was the original sponsor of the International Peace Garden that is located on the American-Canadian border between North Dakota and Manitoba and is now part of the National Parks System.

Donald Richardson of West Orange, New Jersey, horticulturist and well-known orchid grower, was succeeded in the office of president by Benjamin Crowther of New Hyde Park, Long Island.

Panzer-T70 "Compactor". a tractor for garden and farm, was introduced late this past summer by Panzer Products, Inc., of Waynesboro, Virginia. This is a division of the Virginia Metalcrafters, Inc., who have been makers of quality-metal products since 1890 and are known for their beautiful Colonial Williamsburg reproductions. The Panzer division moved from Laurel, Maryland, to Waynesboro in July of this year; it has its own foundries which produce everything for the tractor from raw materials, except the motor and tires.

This new Panzer-T70 "Compactor" was developed after a survey had been conducted among more than one thousand owners of Panzer tractors to learn what improvements they would like in future models. Optional equipment includes a motorized rotary tiller, power-driven saw, double-thickness rotary blade tips for longer wear in mowing grass, and redesigned blade for ease of handling in bulldozing and snow removal.

The Smithsonian Institution has been asked to consider reprinting Standley's *Trees and Shrubs of Mexico* (Contr. U. S. Nat. Herb., Vol. 23, Parts 1-5, pp 1-1712) which has been out of print for years. The Institution would welcome expressions of interest in such a reprint, the cost of which would be approximately $20. Address Editorial and Publications Division, Smithsonian Institution, Washington 25, D. C.

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J. W. Johnston, Garden Editor of the *New York Herald-Tribune* for nearly thirty years, has been honored by the Associated Bulb Growers of Holland. Mrs. Ogden Reid, representatives of the Herald-Tribune, the horticultural press, and horticultural organizations witnessed the presentation at the Hotel Biltmore, New York City, on September 28, 1960, of the eleven-inch-high sterling silver reproduction of a tulip in full bloom. It is mounted on a pedestal.

Bram Warnaar, Chairman of the Associated Bulb Growers of Holland, who presented the beautiful trophy to Mr. Johnston, cited Mr. Johnston's continual efforts to make America aware of the beauty of flowers. Before Mr. Johnston joined the Herald-Tribune, to conduct its "Yard and Garden Competition" in 1931, he ran a similar contest for *The New York World.* During World War II he conducted the "Victory Garden Harvest" which contributed $300,000 to Army and Navy Relief.

During his long and active career, Mr. Johnston has won more than sixteen hundred awards. Among those he values most highly is the Senator Aiken Capper Award that he received for a mixed bouquet of flowers at the flower show in San Leandro, California, in 1929. He picked the flowers from his little backyard garden in southern New Jersey and shipped them to California in dry ice. Mr. Johnston also prizes the gold medal and $1,000 award from the International Flower Show for "educational-excellence in interpreting flower shows to the American public."

BOOK REVIEWS (from page 236)

synonomy, distributional data, and a line drawing for each species within the range, and keys for determination. In addition, Volume IV contains the general key to families and indices to common and to Latin names for all four volumes. Volume IV was written by Mrs. Ferris with the assistance of specialists in various groups.

THEODORE M. BARKLEY
Occidental College
Los Angeles, Calif.

THE LEGUMES OF TEXAS. Turner, B. L. 284 pages, illustrated, indexed, distribution maps. University of Texas Press, Austin, Texas. 1960. $6.00.

This is a floristic treatment of the native and introduced legumes of Texas. It treats a total of 391 taxa, and it includes keys, synonomy, distribution maps, chromosome numbers where known, and considerable ecological and phenological data. In addition, the agricultural potentials of several taxa are pointed out.

THEODORE M. BARKLEY
Occidental College
Los Angeles, Calif.

THE GARDEN FLOWERS OF CHINA. Hui-Lin Li. Ronald Press Company, New York. 1959. $6.50.

Dr. Li traces the origin of the most important plants which have decorated the gardens of the Orient for centuries and in more recent years have added their beauty and usefulness to the gardens of the Western World.

After devoting the first chapter to "China, Mother of Gardens," and the second chapter to "A Historical Sketch of Chinese Horti-

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cultural Literature," Dr. Li treats such plants as the tree peony, chrysanthemum, narcissus, jasmine, in separate chapters, revealing historical and botanical information and the symbolic significance of the particular plant under discussion. He brings the reader up-to-date in the chapter "Recent Introductions in the Garden" and pays tribute to the many men from Father Armand David down through Wilson, Purdom, and Meyer who have enriched horticulture through their plant collections.

The book is written delightfully and attractively illustrated with line drawings and well reproduced plates. D.E.H.

PHYSIOLOGY OF TREES. Kramer, Paul J. and Theodore T. Kozlowski. xiii + 642 pages, illustrated, indexed. McGraw-Hill Book Company, Inc., New York. 1960. $12.50.

In a continuation of McGraw-Hill's notable series of publications in the botanical sciences, Professors Kramer and Kozlowski have compiled the first text in English on the physiology of trees. The sixteen chapters comprehensively cover growth, reproduction, photosynthesis, and metabolism and present outstanding syntheses of the water relations of trees. This book will undoubtedly be in use by forestry students, botanists, and horticulturists for many years.

RICHARD M. KLEIN

RADIATION, GENES, AND MAN. Wallace, Bruce and Th. Dobzhansky. viii + 205 pages. Illustrated, indexed. Henry Holt and Co., New York. 1959. $3.50.

Two distinguished scientists have written a clear, precise book on the problems facing all of us in this nuclear age. They analyze in unambiguous terms the hazards and problems which man must face in his exploitation of atomic energy for war and peace.

This book should be required reading for all who are concerned with the genetic future of our species.

RICHARD M. KLEIN

MICROBIAL VARIATION. Timakov, V. D. (Ed. by). 202 pages—illustrated, indexed. Pergamon Press, New York. 1959. $6.50.

This volume contains an English translation of reports in Russian of research carried out at the Gamaleia Institute of Epidemiology and Microbiology, the purpose of which was to find out whether variation in microorganisms could be so directed as to obtain virulent strains of pathogenic bacteria having immunizing ability.

ALMA W. BARKSDALE

INDEX MUSCORUM—VOL. I (A-C). Van der Wijk, R. (Chief Editor), W. D. Margadant and P. A. Florschütz. xxviii, 548 pages, indexed. The International Bureau for Plant Taxonomy and Nomenclature, Utrecht, Netherlands. $15.00 ($8.00 to members of Int. Assn. for Plant Taxonomy) 1959.

This is the first of five volumes that eventually will list all published names of the mosses of the world. More than thirty-five years have elapsed since the appearance of the last index to mosses, so that this monumental work, scheduled to appear at the rate of one volume a year, will greatly facilitate the work of all botanists engaged in the study of mosses or who must deal, in their curatorial or editorial duties, with the names of mosses. Grants of funds by the National Science Foundation to aid in the preparation and publication of this reference work reflect the international aspect of our urgent need for it.

WILLIAM C. STEERE

THE BIOLOGY OF MYCORRHIZA. J. L. Harley. 233 pages, illustrated, indexed. Interscience Publishers, Inc., New York. 1959. $8.75.

Dr. Harley uses the word "mycorrhiza" for the wide range of structures composed of fungal hyphae and the roots, rhizomes or thalli of other plants. The subject is presented in a form to interest biologists who are experimentally inclined. The first part deals with the general considerations of the associations of fungi with roots; the second part considers the ectotrophic mycorrhizas of forest trees including morphology, physiology, and ecology; the third part deals with the endotrophic mycorrhizas of ericaceous plants, orchids, mosses, etc.

CLARK T. ROGERSON

MUSHROOMS OF THE GREAT SMOKIES. L. R. Hesler. 289 pages, illustrated, indexed. University of Tennessee Press, Knoxville, Tenn. 1960. $5.50.

This is a field guide to some 193 mushrooms and their relatives which occur in the Great Smoky Mountain National Park. It is written for the amateur. The excellent black and white photographs, the keys, and the brief descriptions provide the means for identification. Most of the species included occur throughout eastern United States; hence the handbook will be useful in other areas.

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FIFTY YEARS OF CITRUS. The Florida Citrus Exchange—1909-1959. James T. Hopkins. University of Florida Press, Gainesville, Fla. x + 279 pages, indexed. 1960. $5.00.

The book is a detailed history of the people and activities of the Florida Citrus Exchange and the effect of this organization on the citrus industry. For one interested in citrus or citrus trees, the title is misleading.

DAVID J. ROGERS

SOIL CONSERVATION. Kohnke, Helmut and Anson R. Bertrand. 298 pages, illustrated, indexed. McGraw-Hill Book Company, Inc., New York. 1959. $6.75.

A textbook intended "to provide a clear picture of the fundamental nature and causes of soil erosion, of the aims of soil conservation, and of the methods of saving the soil and of maintaining its productivity."

ARTHUR CRONQUIST

ANTHROPOLOGICAL PAPERS (Glen Canyon Series No. 7). Woodbury, Angus M., (Biological Editor). 226 pages, illustrated. University of Utah Press, Salt Lake City, Utah. 1959. $3.50.

A presentation of the known information on the flora and fauna of Glen Canyon, Utah, with an outline of studies proposed to be made before the canyon is flooded by the lake behind the dam now under construction.

ARTHUR CRONQUIST

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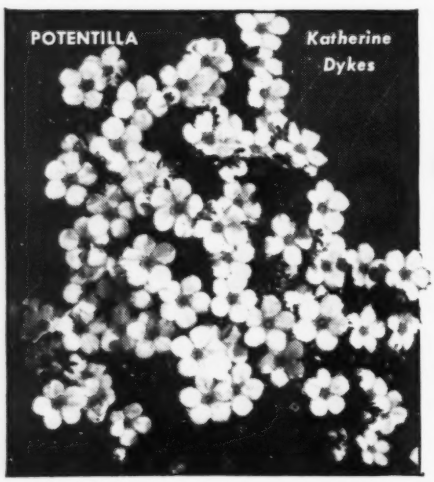

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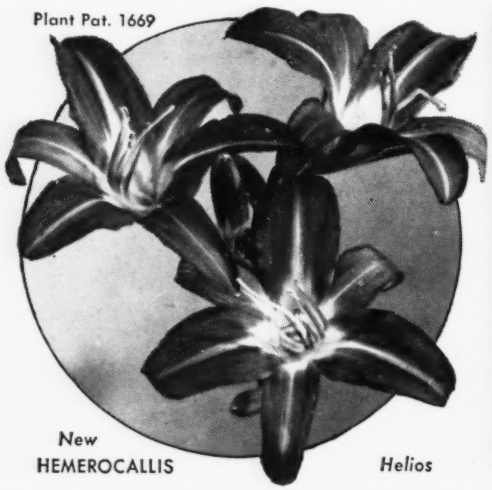

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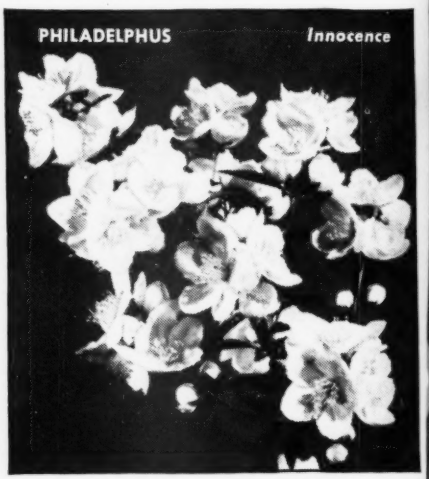

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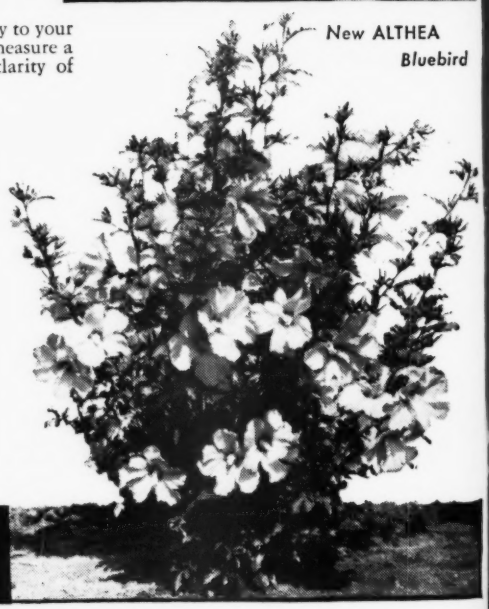

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